September/October 1982 Volume 2, Number 5 $2.95 (USA) £1.50 (UK)

The magazine for Sinclair users

SYNC®

SYNC in the Classroom:
List Learning, Maps and Mazes, Arithmetic, Solving Equations
• Machine Language: Block Transfers • Hardware: Repeat Key
• Games: House of Horrors, Space Taxi, Chase

ROM-PAC APPLICATIONS HAS PROGRAMS ON PLUG-ON ROM CARTRIDGES FOR THE ZX-81

*EDUCATIONAL PROGRAMS
*APPLICATIONS
*GAMES

Call or Write For Your
FREE
Information Package Including:
*Current list of products and prices
*Operating instructions for all products
*Sample applications
*Adds you to our mailing list to receive new product news
*Updates on using the Sinclair with and without our products

CALL 404-921-4471
OR WRITE

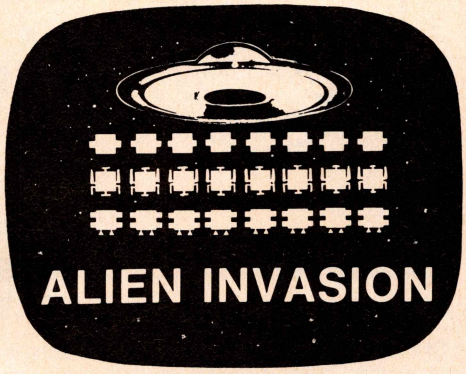
ROM-PAC APPLICATIONS
5921-A Alhambra
Norcross, Georgia 30093

Due to possible trademark infringement Sinclair Applications is now operating under the name of Rom-Pac Applications. Neither Sinclair Applications nor Rom-Pac Applications has or have had any connections with Sinclair Research Ltd.

SEEING IS BELIEVING

Shoot your way out of the asteroid field
Exclusive from Quicksilva **16K 14.95**

Scramble between treacherous mountains and fearsome aliens **16K 14.95**



The best TS/ZX version of this classic game **16K 14.95**

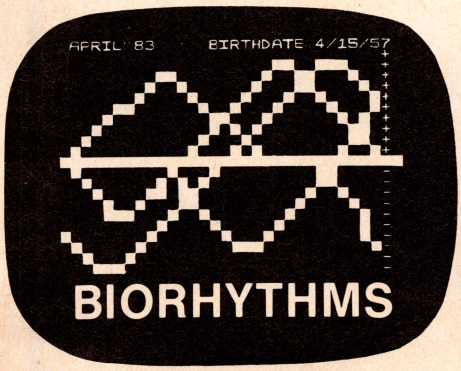
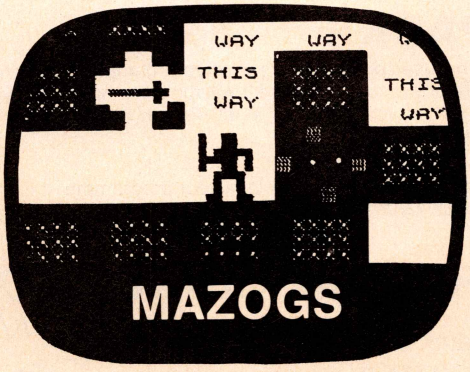
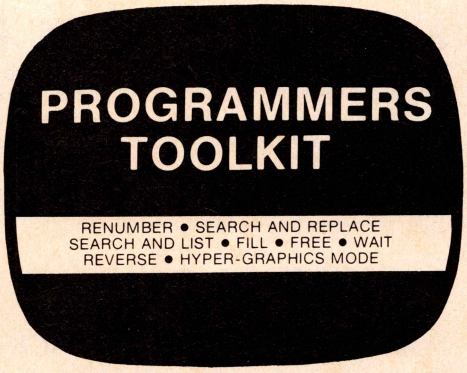


Chart your ups & downs **16K 14.95**



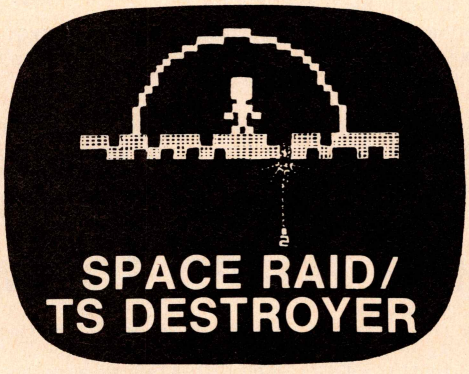
Exclusive from Bug Byte. You won't believe this maze adventure. **16K 19.95**



Exclusive from Paul Holmes **16K 14.95**

Solve this adventure for a 10,000 pound sterling payoff **16K 19.95**

*Registered trademark of International Publishing & Software Inc.



Two great 2K programs **2K 14.95**

Exclusive from Paul Holmes **16K 14.95**

MORE TS1000/ZX81 SOFTWARE FROM...

SOFTSYNC, INC.

P.O. Box 480, MURRAY HILL STATION, N.Y. N.Y. 10156

(212) 685-2080 M/C & VISA ACCEPTED

WRITE FOR FREE CATALOG & PROGRAM LISTING

KAYDE Electronic Systems

ZX80/1
ZX KEYBOARD WITH REPEAT KEY

$75-90

Fully cased keyboard $75.90
Uncased keyboard..... $55.90
Keyboard Case..... $21.90

This is a highly professional keyboard using executive buttons as found on top quality computers. It has a repeat key and comes complete in its own luxury case. This is a genuine professional keyboard and should not be confused with toy keyboards currently available on the market

KAYDE 16K RAM PACKS

$59-90

The 16K RAMPACK simply plugs straight into the user port at the rear of your computer. It is fully compatible with all accessories and needs no extra power and therefore it will run quite happily on your Sinclair power supply. It does not over-heat and will not lose memory at all. As you may know, some makes go down to 11K after being on for a while.

This 16K RAMPACK is very stable and will not wobble or cause you to lose your programme. It comes fully built and tested with a complete money-back Guarantee.

KAYDE FLEXIBLE RIBBON CONNECTOR

$25-90

Stops movement of RAM PACK and other accessories
(Not needed with a *KAYDE* RAMPACK)

KAYDE 4K GRAPHICS BOARD

$59-90

The *KAYDE* Graphics Board is probably our best accessory yet. It fits neatly inside your ZX81. It comes complete with a pre-programmed 2K Graphics ROM. This will give nearly 450 extra graphics and with the inverse makes a total of over nine hundred.

The *KAYDE* Graphics Board has facilities for either 2K of RAM (for user definable graphics), 4K of ROM or our 4K Tool Kit Chips that will be available shortly. All the graphics are completely software controlled, therefore they can be written into your programmes. Here are a few examples: **A full set of space invaders — Puckman — Bullets, Bombs — Tanks — Laser Bases and Alien Ships.**

NO EXTRA POWER NEEDED

KAYDE 16K GRAPHICS BOARD SOFTWARE

$11-90

PECKMAN: The only true ZX version of the popular arcade game.
Centipede: "In all I think this is the best presented moving graphics program I've yet seen." Phil Garratt, Interface.
SPACE INVADERS: The best version available anywhere. Graphics software can only be used with a graphics board.

KAYDE 16K 81 SOFTWARE

$11-90

Centipede: "In all I think this is the best presented moving graphics program I've yet seen." Phil Garratt, Interface.
3D/3D Labyrinth: A Cubit Maze that has corridors which may go left, right, up, down. Peckman (the latest addition in 81 games).

WHY WAIT TO PAY MORE —
FAST, IMMEDIATE DELIVERY

Post to: Dept SY1
Kayde Electronic Systems Ltd
The Conge
Great Yarmouth
Norfolk NR30 1PJ ENGLAND
Tel: 0493 57867 (Dept. SY1)

Please pay by
International money order or certified
cheque for immediate delivery.

Please send me	ZX Keyboards with repeat key	$75-90 each
Please send me	16K RAMPACKS	$59-90 each
Please send me	Flexible ribbon connectors	$25-90 each
Please send me	4K graphics boards	$59-90 each
Please send me	16K graphics board software	$11-90 each
Please send me	16K 81 software	$11-90 each

I enclose _____

Name _____

Address _____

_____

_____

Please add $5 p&p for all hardware and $2 for all software. Please make cheques payable to Kayde Electronic Systems Ltd.

The magazine for Sinclair users

SYNC

September/October 1982 Volume 2, Number 5

DEPARTMENTS

6 **Letters**

8 **Glitchoidz Report**

12 **SYNC Notes** ... *Grosjean*

18 **TRY This** ... *Klyver, Kluth, Laska*

20 **Just for Fun** ... *Dewhurst, Hampson*

24 **Perceptions** ... *Ornstein*
The ZX Parser and the Operations Routines

88 **Hardware Tips** ... *Chaiet*
MicroAce Hardware Peculiarities

92 **Resources**

96 **Index to Advertisers**

SYNC IN THE CLASSROOM

29 **List Learning with the ZX81** ... *Hollandsworth*
A program for memorizing lists

34 **Teaching with the ZX81** ... *Deeson*
An overview of the British scene

42 **Maps and the ZX80/81** ... *Doakes*
Rethinking maps and mazes

50 **How Many Blocks** ... *Kelly*
A program for preschoolers

54 **Elimination** ... *Klyver*
Developing math and strategy skills

55 **Arithmetic with a Smile** ... *Repicky*
A tool for elementary math drills

56 **Arithmetic series** ... *Van Workum*
Developing math concepts through series

58 **Solving Implicit Functions** ... *Wentworth*
Working with equations; algebra help

62 **BOLEX: Beginner's Ohm's Law EXercises** ... *Stadta*
Help for general science and physics

HARDWARE

66 **Repeat Key Option** ... *Ingle*
Build your own repeat key

MATH

68 **Degrees, Grads, and Radians** ... *Lam*
Conversion programs

69 **Rounding Off and Conditional Tests** ... *Stauffer*
Pythagorean triples

MACHINE LANGUAGE

70 **Block Transfers** ... *Scher*
Machine language programming technique

GAMES

75 **Chase** ... *Yu*
Pit your survival skills against the robot warriors

77 **Space Taxi** ... *Dewhurst*
To the Spaceport, fast

80 **House of Horrors** ... *Duchene*
One for Halloween

85 **Mouthful** ... *Day*
Random wit and wisdom for your next party

90 **8K ROM Updates** ... *Ahl, Horton, McGath, McLauglin*
Nicomachus, Castle Doors, Widget, Hurkle

REVIEWS

78 **The Complete Sinclair ZX81 Basic Course** ... *Blechman*
Book review

79 **ZX81 Chess vs. ZX Chess II** ... *Wren-Hilton*
Software review

Staff

Publisher/Editor-in-Chief ... **David H. Ahl**
Managing Editor ... **Paul Grosjean**
Contributing Editor ... **David Ornstein**
U.K. Correspondent ... **Martin Wren-Hilton**
Secretary ... **Elizabeth Magin**
Art Director ... **Susan Gendzwil**
Assistant Art Director ... **Diana Negri Rudio**
Typesetters ... **Karen Brown**
Renea Cole
Financial Coordinator ... **William L. Baumann**
Personnel and Finance ... **Patricia Kennelly**
Circulation ... **Frances Miskovich**
Carol Vita
Advertising Sales Manager ... **Jim Beloff**

Volume 2, Number 5

SYNC (USPS: 585-490; ISSN: 0279-5701) is published bi-monthly by Ahl Computing, Inc., a subsidiary of Ziff-Davis Publishing Company. David Ahl, President; Elizabeth B. Staples, Vice-President; Selwyn Taubman, Treasurer; Bertram A. Abrams, Secretary. 39 E. Hanover Ave., Morris Plains, NJ 07950. Second class postage paid at New York, NY 10001 and at additional mailing offices.

Subscription rates: USA: One year (6 issues), $16; two years (12 issues), $30; three years (18 issues), $42. Canada: $3 per year additional. Other foreign: $5 per year additional.

For *SYNC* advertising information, contact Jim Beloff, *SYNC* Advertising Sales Manager, Ziff-Davis Publishing Company, One Park Ave., New York, NY 10016 (phone: 212/725-4216).

All other correspondence should be addressed to: *SYNC*, 39 E. Hanover Ave., Morris Plains, NJ 07950. In U.K., *SYNC*, 27 Andrew Close, Stoke Golding, Nuneaton CV13 6EL.

Postmaster: Send address changes to *SYNC*, PO Box 789-M, Morristown, NJ 07960.

MEMBER MITA

Cover photo and other photos of the Sinclair computer and the children courtesy of **Donna Compton**.

data-assette®

SOFTWARE and ZX81 TIMEX 1000 SUPPLIES

GAMES, EDUCATION, HOME OR BUSINESSS APPLICATIONS

Choose from our Extensive collection of over 100 programs, far too many to list here so if you don't see something you like, send for our catalogue, $2.25 handling and —credit on your first purchase.

GAMES

MAZOGS
A large complex maze which contains a glittering and fabulous treasure. You not only have to find the treasure and bring it out of the maze, but face the guardians of the maze in the form of fearful MAZOGS. Even if you survive you could starve to death if you get lost. 3 levels of difficulty. only *$29.95* 16K

GALAXIONS
Features of an arcade game. Attacks-Defends and keeps personal scores. only *$14.95* 16K

BATTLE SHIP
Play against the computer to destroy its battle ships, cruisers, destroyers, etc. only *10.95* 16K

VOLCANIC DUNGEON/HANGMAN
1. Attempt to rescue the elfin princess; mystical monsters, pits, fireyheavens. Reducing strength and water make the quest anything but easy.
2. Deluxe version of the classic game, play against second person or computer with 400 word vocabulary. only *$10.25* 16K

ALIEN INTRUDER/HIEROGLYPHICS
1. You find you are the only survivor on the Explorer Class III star ship. Try and escape before you fall victim to the alien monstrosity that destroyed the crew.
2. Decode the ancient 39 symbol alphabet in time to save a famous explorer. only *$10.25* 16K

WUMPUS ADVENTURE/MOVIE MOGUL
1. 1-4 players seek the famous creature in the most famous and dangerous Wumpus hunt ever.
Features: Super Bats, Pits, Tremors, Swamps, Magic Arrows, Giant Sea Serpents, Wumpus Muk and Magic Springs.
2. Guide making you through the often hilarious traumas of production. Use your budget wisely to make a fortune. only *$10.25* 16K

GREAT UNCLE ARBUTHNOT'S INHERITANCE
You are left $100,000 but first must turn $100,000 of it into a further $100,000 by investing in the British Stock Market and Metal Exchange in 26 weeks. You then have a further 26 weeks to make $100,000 running a soft drink factory. only *$10.25* 16K

GREAT BRITAIN LTD.
You are the Prime Minister and Chancellor of the Exchequer of Great Britian. Your aim is to stay in office as long as possible. *$10.25* 16K

AROUND EUROPE IN 80 HOURS
You have a bet of $20,000 to visit 12 capital cities in Europe in two and a half days, travel agents permitting. only *$10.25* 16K

HOME-SAVINGS

FINANCE I
Balance and maintain checkbook. No overdrawn or returned checks. only *$9.95* 16K

DATES
Keep your diary in order. only *$8.50* 16K

HOME PLAN
Keep track of your food and freezer needs. only *$9.95* 16K

APPLICATION PROGRAMS

TOOL KIT
Provides many special features (line number, search and replace, free space, etc.) plus special graphics mode and tape routine. only *$10.25* 16K

GRAPHICS TOOL KIT
22 exciting Machine code routines that give you control over your screen as never before. only *$10.25* 16K

MICRO-MUSIC
Convert your keyboard into an organ mantle. only *$8.50* 16K

EDUCATIONAL - Learn

CHESS I
Six levels and analysis options. only *$12.95* 1K

CHESS II
Seven levels and a recommended move option. only *$24.95* 216K

ZX-BUG
30 in 1 tool. Disassemble. Access all registers, search, modify memory with cassette routines. only *$14.95* 16K

BUSINESS - Opportunity

ZX-99 TEXT
Fantastic word processor with output to your printer through our ZX-99. *$29.95* 16K

BASIC BUSINESS I
Cash flow control and planning. *$16.95* 16K

Coming in the next issue: HIGH RESOLUTION GRAPHICS BOARD AND COLOR All for your ZX-81/Timex 1000
DEALERS WANTED/INQUIRIES WELCOME

data-assette®56 South 3rd Street, Oxford, PA 19363 Telephone Orders 1-800-523-2909 In Pennsylvania (215) 932-4807

data-assette®

ZX81 or TIMEX 1000

Your One Stop Shop All Products Guaranteed

EVERYTHING YOU WILL NEED!! ADD ON TO YOUR ZX81/TIMEX 1000!! ALL PRODUCTS 100% GUARANTEED!! NOW GROW YOUR SYSTEM AS YOUR NEEDS CHANGE, AND WE WILL GIVE YOU PRODUCTS, SERVICE, SOFTWARE AND ADVICE. WE HAVE BEEN IN THE BUSINESS IN ENGLAND FOR OVER ONE YEAR AND OFFER THIS EXPERIENCE TO ALL OUR CUSTOMERS.

New Low Prices

1st STEP - MEMORY = RAM

16K - 32K or 64K

$59.95 - $109.95 or $149.95

Each RAM extends the BASIC memory to provide the user space for all applications.

2nd STEP - KEYBOARDS FULL SIZE or MINI $75.00

Real Professional KEYBOARDS Computer Size and with special features like!!!!Repeat Keys on the full size. Both units are easy to install at home. Supplied with cables & instructions.

3rd STEP-ZX-99 $150.00

TAPE CONTROL

Now add Real "DATA-PROCESSING" power to your ZX-81 with our sophisticated extension. Provides "FULL SOFTWARE CONTROL" of four (4) tape decks and a PRINTER interface for any RS 232 Serial Printer, giving full 132 ASC II characters of output.

Plus!!!!!!

* * AUTOMATIC "TAPE TO TAPE COPY"

* * TAPE BLOCK SKIP, DIAGNOSTIC ASSISTANCE

INTRODUCTORY OFFER "$375.00"

Special to New Owners, show us your invoice and order in 30 days from the date. We will give you this "FULL PACKAGE" for the low price of $300.00. 64K RAM + ZX99. Add it to your printer and for under $400.00 you have full MINI-CAPABILITIES.

**** DATA RETREIVAL WORD PROCESSING ** RS 232 C Serial Printer Interface EQUALS REAL MINI-COMPUTER CAPABILITIES**

BLANK CASSETTES

C-5	$.69
C-10	$.74
C-12	$.77
C-15	$.79
C-20	$.84
C-25	$.89

plus Shipping $4.95

CHARGE TO: VISA MASTERCARD

account number

Expiry date

Signature

Date

NAME

ADDRESS

Please rush me:

Quantity	Price	Total

SHIPPING

TOTAL

SYC-2

Send me details:

- ☐ Software
- ☐ Supplies
- ☐ User Clubs
- ☐ Local Dealers
- ☐ New Products

Hi-Resolution or Color Boards

data-assette® 56 South 3rd Street, Oxford, PA 19363 Telephone Orders 1-800-523-2909 In Pennsylvania (215) 932-4807

letters

ROMs and RAMs

Dear Editor:

Could you please put more programs for the ZX80 with the 8K ROM in *SYNC*? All I notice is programs mainly for the ZX80 with the original 4K ROM and the ZX81.

Cris Bottjer
RR #2, Box 86-A 500 E.
Kendallville, IN 46755

Ed.—See "ROMs and RAMs" in SYNC Notes in this issue.

Memory Saving Tips

Dear Editor:

I want to call the attention of *SYNC* readers to the second paragraph on p. 129 of the 8K ROM manual: "A numerical constant in the program is followed by its binary form, using the character CHR$ 126 followed by five bytes for the number itself." This is a very inefficient way to store numbers.

Dr. Ian Logan in *SYNC* 2:2 showed some good ways to get around this inefficiency by using SGN PI and NOT PI for 1 and 0. He also used VAL "number" which saves three bytes. I suggest using one letter variables to hold numerical constants if you use the same constants more than once, or, if you use numbers that are more than four digits long. Declare these variables from the command mode so that they do not occupy program space.

Another way to save memory is to use GOTO CODE "C" instead of GOTO VAL "40". A byte saved is a byte earned. This same technique could be used for any number between 10 and 255 even though not all these characters can be accessed from the keyboard. Consider the following line:

```
500 LET N=N/100
```

You can accomplish the same thing with:

```
1 LET N=N/CODE "N"
POKE 16520,100
```

After these lines are entered, line 1 will look like:

```
1 LET N=N/CODE "?"
```

Now all you have to do is EDIT and renumber the line to 500. If you want to do several lines this way, type your program from the highest line number to the lowest so that the line you just typed will always be the first line in memory.

John Coffey
PO Box 448
Scottsburg, IN 47170

Dear Editor:

Concerning Gary Chandler's "Alien Treasure" in *SYNC* 2:4, there are several ways to increase the efficiency and speed of the program.

First, the four lines which check the bounds (132-135) can be deleted if logic is used:

```
 89 LET I$=INKEY$
 90 IF NOT I$="" THEN PRINT AT
A,B;"■"
 91 IF I$="" THEN GOTO 89
 95 IF I$="0" THEN LET A=INT (R
ND*22)
 98 IF I$="5" THEN LET B=B-(B>0
)
100 IF I$="8" THEN LET B=B+(B<3
1)
110 IF I$="6" THEN LET A=A+(A<2
1)
120 IF I$="7" THEN LET A=A-(A>1
)
```

If the expression in parentheses is true, it has a value of one; otherwise the variable is not changed. Also, INKEY$ could change between lines; therefore it is always best to assign INKEY$ to a variable and then check it as in the example above.

Second, lines 81-84 indicate which direction the monster is to move. This can best be done by using SGN. Delete lines 81 and 83, and then enter:

```
82 LET X=X+SGN(A-X)
84 LET Y=Y+SGN(B-Y)
```

SGN returns -1 if the expression in parentheses is negative, 1, if positive, and 0 otherwise. Then the variables X1 and Y1 can be deleted by deleting lines 7, 8, 86, and 87.

Third, if the inspiration is great enough, the array can be deleted and a PEEK can be done to the screen location desired. Use

```
LET S$=CHR$ PEEK (PEEK 16396+
256 * PEEK 16397+33* R+C+1)
```

where R is the row and C is the column. The character at that position is returned in S$.

Michael Williams
1300 DePaul Way
Virginia Beach, VA 23464

The SAVE Signal

Dear Editor:

A friend recently purchased Sinclair's 16K RAM pack, but found that the SAVE signal was drowned out by the extra noise it caused. After trying several types of filtering, I found two large foil tabs on the underside, one by the edge connector and the other next to the regulator. Connecting these with wire and rosin core solder reduced the resistance and the noise.

Raymond Fowkes
PO Box 336
Coalinga, CA 93210 ■

Has Down Time Got You Down?

MicroSync Has The Answer

As Sinclair's Exclusive Authorized Service Center, we have the experience and expertise to keep your ZX product operating properly.

WE OFFER

- Maintenance Agreements on Sinclair and Timex/Sinclair Products
- Reliable Low Cost Repairs
- Prompt Turnaround
- Sinclair Factory Replacement Parts

A MICROSYNC MAINTENANCE AGREEMENT IS A VERY GOOD IDEA...

Protect your Computer Investment With the Purchase of a MicroSync Maintenance Agreement. For a low cost yearly fee MicroSync will provide all parts and labor necessary to keep your computer operating properly. Our maintenance agreement also covers one-way shipping costs for all repairs. (You pay only the cost of sending the unit to us.) You will have no unexpected repair bills or service worries during the period of maintenance agreement coverage.

To Purchase a Maintenance Agreement Use the Coupon Below.

	Equipment	Unit Price	Qty.	Total
Maintenance Agreement Purchase	ZX81/TS1000	14.95		
	16K RAM/TS1016	14.95		
	ZX Printer	16.95		
If Unit is Less Than 90 Days Old. **(Proof of Purchase is Required.)**				
Maintenance Agreement Purchase	ZX81/TS1000	34.95		
	16K RAM/TS1016	34.95		
	ZX Printer	39.95		
If Unit is Over 90 Days Old.				

Total Enclosed $_____

☐ I Would Like to Purchase a MicroSync Maintenance Agreement.
☐ My check or money order is enclosed.
☐ I would like to pay by ☐ Visa ☐ MasterCard.
My credit card # is _____.
Its expiration date is _____.
Signature _____
☐ I Would Like Additional Information.

To: MicroSync Services, 162R Marlboro St., Keene, NH 03431
My Return Shipping Address is printed below.

name _____
address _____
city _____ state _____ zip _____
Phone ( ) _____

Glitchoidz Report

Pseudo-Glitchoidz

From time to time readers call our attention to "Glitchoidz" they have met in entering programs. However, on closer examination we find that these are "pseudo-Glitchoidz" because the problem is not in the listing. You can avoid these "pseudo-Glitchoidz" by paying close attention to the following suggestions:

1) *Before starting to enter a program, note the* **ROM** *requirements as shown in the upper right or left corner of the first page of the article.* A 4K ROM program is for a ZX80 or MicroAce; an 8K ROM program is for the upgraded ZX80 or MicroAce, the ZX81, and the Timex/Sinclair 1000. You *cannot* enter a 4K ROM program on an 8K ROM machine or vice versa without translation. This seems to be the most common problem new users encounter. Wherever possible we give both listings. Usually 4K ROM programs can be translated to the 8K ROM, but the reverse is often difficult.

2) *Pay careful attention to the* **RAM** *requirements* before you start typing in the listing.

3) *Read the article through carefully* **before** *attempting to enter the program.* While we can sympathize with our readers' eagerness to try out the new programs, we remind everyone that the programs are usually a part of a tutorial article and that the article contains necessary information about the program.

4) *Enter the program* **as printed** *in the listing* taking into account any directions given in the article. Be sure you know what the program is supposed to do. If the program does not run, assume first that an entry error has been made and double check your entry. All the 8K ROM programs which look like the listing for "List Learning with the ZX81" in this issue are *direct printouts* from our ZX81. The program was entered on it, tested (and found to work as the author indicated), and then printed out directly from the computer with no intermediate typing stage. This does not mean that the program has no bugs, but the listing printed *did run* without bugs during the time we tested it. Occasionally some characters are not as clear as we would like due to the reproduction process, but the computer will tell you if this results in a syntax error while some experimentation may help locate the correct entry in other

ZXPRESS--

Non-Trivial Solutions' new Integer Basic Compiler! Now you can write programs in rapid time!

- compiles ZX-81 Basic source code to machine language: write and debug in a subset of ZX-81 Basic; compile when it's right
- increases the speed of the ZX-81 20 to 50 times
- 208 regular variables, 26 dimensioned variables; variables are 16 bit two's complement integers
- compiled code can be stored in REM or in 2000H to 3FFFH address segment, if available
- the source code can be located anywhere and the position of the compiled code can be selected, allowing you to write a long program, compile it in pieces, and link the pieces
- 3 functions--PEEK, RND, & USR
- 14 key words
- $29.95

Still available:

- Letter Raiders & Life with Palette
  - challenging games
  - $9.95 each

	QUANTITY	PRICE	TOTAL
ZXPRESS		$29.95	
Letter Raiders		$9.95	
Life with Palette		$9.95	

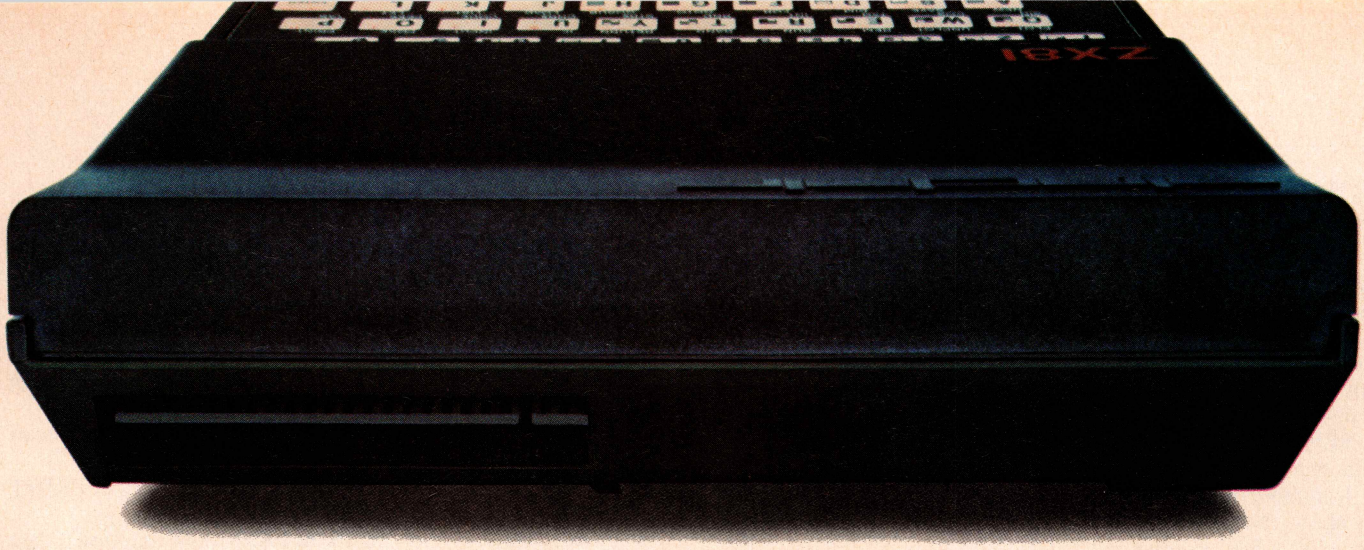
☐ Check enclosed Charge my ☐ Mastercharge ☐ Visa

Card No. _____ Exp. Date _____

Signature _____

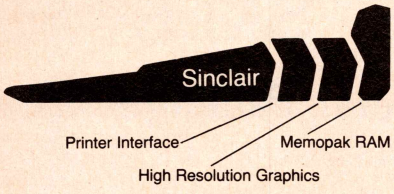
NTS NON-TRIVIAL SOLUTIONS

P.O. Box 2941
Amarillo, Texas 79105
(806) 376-5723



BEHIND EVERY GOOD SINCLAIR IS A MEMOPAK

If you own a Timex-Sinclair 1000 or ZX81 computer, you should have a Memopak behind it. From increased memory to high resolution graphics, Memotech has a Memopak to boost your system's capabilities. Every Memopak peripheral comes in a black anodised aluminum case and is designed to fit together in "piggy back" fashion to enable you to continue to add on and still keep an integrated system look.



Order at no risk

All Memotech products carry our 10 day money back guarantee. If you're not completely satisfied, return it in ten days and we will give you a full refund. And every Memotech product comes with a six month warranty. Should anything be defective with your Memopak, return it to us and we will repair or replace it free of charge. Dealer inquiries welcome. To order any Memotech product call our toll-free number **800/662-0949** or use the order coupon.

MEMOTECH
CORPORATION

7550 West Yale Avenue
Denver, Colorado 80227
(303) 986-1516
TWX 910-320-2917

Mail to: Memotech Corporation, 7550 West Yale Ave., Denver, CO 80227

Code: SYCO-9-10

	*Price	Qty.	Total
64K RAM	$179.95		
32K RAM	109.95		
16K RAM	59.95		
Centronics Parallel Printer Interface	104.95		
RS232 Printer Interface	139.95		
High Resolution Graphics	144.95		
Shipping and handling	4.95		$4.95
		Tax**	
		Total	

* All prices quoted in U.S. dollars
** Colorado residents please add sales tax
☐ Check ☐ MasterCard ☐ Visa

Account No. _____ Exp. _____

Name _____

Address _____

City _____ State _____ Zip _____

Memopak 64K RAM The 64K RAM extends the memory of your Sinclair by 56K to a full 64K. It is directly addressable, user transparent, is neither switched nor paged and accepts such BASIC commands as 10 DIM A (9000). The Memopak 64K turns your Sinclair into a powerful computer suitable for business, recreational and educational use. No additional power supply is required.

Memopak 32K RAM The 32K RAM Memopak offers your Sinclair a full 32K of directly addressable RAM. Like the 64K Memopak, it is neither switched nor paged and enables you to execute sophisticated programs and store large data bases. It is also fully compatible with Sinclair's or Memotech's 16K RAM to give you a full 48K of RAM.

Memopak 16K RAM The Memopak 16K RAM provides an economical way to increase the capabilities of your Sinclair. And at the same time, it enables you to continue to add on other features with its "piggy back" connectors. It is compatible with the Sinclair 16K or a second Memopak 16K or Memopak 32K to give 32K or 48K of RAM respectively.

Memopak High Resolution Graphics The Memopak HRG contains a 2K EPROM monitor and is fully programmable for high resolution graphics. The HRG provides for up to 192 by 248 pixel resolution.

Memopak Printer Interface The Memopak Centronics Parallel or RS232 Interface paks enable your Sinclair to use a wide range of compatible printers (major manufacturers' printers available through Memotech at significant savings). The resident software in the units gives the ASCII set of characters. Both Memopak printer interfaces provide lower case character capabilities. The RS232 Interface is also compatible with modems.

New products coming soon Memotech will soon be introducing four new Sinclair compatible products: a high quality, direct connection keyboard, a digitizing tablet, a 16K EPROM and a disk drive. Watch for our future advertisements.

SYNC Program Listings

Readers should note the following conventions used in the program listings in this issue:

The **ROM** and **RAM** requirements for running a given program are shown in the upper outer corner of the first page of an article. *Observe these carefully.*

NEWLINE and **ENTER** are used interchangeably.

A number may be followed by a letter to show the type: b for binary; d for decimal; h for hexadecimal.

In PRINT statements:

#: Enter a necessary space.

A (32): Use the graphic character on the A key 32 times. The underline means get the graphic on the key given in the line by whatever way your machine uses to get the graphic. An overline means use the letter in inverse form, e.g., A.

INPUT: An underlined word found on the keyboard should be entered from the keyboard, not spelled out. If the keyword will not enter, hit THEN, the keyword you want, backspace and delete THEN, continue entering the line. This memory saving technique may be disregarded if you have enough RAM.

cases. The 4K ROM programs, however, are not direct printouts so there is the possibility of an error in these listings.

5) *Do not attempt to make changes in a program which does work* **before** *you understand the program as written.* Again, remember the author is trying to show you something.

6) *Be sure you know whether a given word in the program is a* **keyword**, *that is, a word entered from the keyboard in one stroke, or a word that must be spelled letter by letter.* If a keyword is used within the quotation marks in a print statement, it does not function as a command but as the word in its normal meaning. This is a memory saving technique which can be ignored if you have the additional memory.

An Alternative Display Method. 2:3.
Space Warp. 2:3.

These programs are for machines with the 4K ROM. The problems reported by some readers stem from trying to enter these programs on the ZX81. So the solution is quite simple: Do not attempt to enter a 4K ROM program on an 8K ROM machine or vice versa.

DEF. 2:4

Listing 3: Change line 110 to:
110 DIM F$(5,17)

The program will work in 2K.

ZX Destroyer. 2:4, pp. 49-50.

The author has called the following to our attention:

1) Both the 4K and 8K versions can run on as little as 2K RAM.

2) Figure 4: Line 150: Delete the set of quotation marks after the comma.

3) Figure 5: Line 20 could read PRINT "ZX DESTROYER".

4) Figure 6: l REM, 6th line down, last character. This is a U, not a W as it might appear.

5) Figure 8: Delete lines 10-35.

Renumbering by a USR Routine. 2:3, p. 12.

The author notes a minor correction and a possible problem.

1) The quotation marks between TAB and RND in both cases are inverse.

2) The E between V and 7 may have to be changed to 3 on some ROMs. The manual *ZX81 BASIC Programming* (1st ed., 1980) shows the same character for codes 7 and 135. The 135 is in error; it is the inverse of 7. *Ed.-Both E and 3 work on our ZX81.*

FLORIDA CREATIONS PRESENTS:

THE GREAT SOFTWARE SALE

(ZX81-1K)

Christmas Party Package

(3 LISTINGS FOR $1)

Music-Plays "Jingle Bells" over a standard radio using the natural radio frequency interference of the ZX 81. No hardware modifications are required!

Christmas Scroll-Horizontally scrolls "Merry Christmas" across the screen with large letters.

Christmas Tree-Automatically draws and decorates a Christmas tree.

Home Financial Package

(3 LISTINGS FOR $1)

Mortgage Analysis-Calculates monthly payments for home or car loans.

Return on a Bond Investment-Calculates the actual rate of return for bonds bought at other than face value.

I.R.A. Planner-Calculates your I.R.A. retirement possibilities.

**** ORDER NOW SALE ENDS SOON **** INCLUDE SASE WITH ORDER **
*FLORIDA CREATIONS,SC2,P.O.Box 16422,Jacksonville,FL,32216 **

SINCLAIR/TIMEX USERS
NOW SYNERGISTIC OFFERS YOU THE 'SMART™' CHOICE DESIGN

THE *SYSTEM LOGIC KBD-I*
'SMART™' KEYBOARD
ENHANCEMENT FOR
SINCLAIR/TIMEX
COMPUTERS

All units shipped with silk screened graphics comparable to those of Sinclair/Timex machines. We regret these were not available for *this* advertisment.

SYSTEM LOGIC — KBD-1

The System Logic KBD-I Keyboard enhancement offers Sinclair ZX-80, ZX81 and Timex TS-100 users an intelligent keyboard peripheral.

A KBD-I allows an increase in user throughput by as much as 70% while reducing fatigue factor errors.

Now enter data and programs quickly without having to 'hunt' for key contacts. Each key produces 'tactile' feedback in addition to employing right-and left-hand 'smart' shift keys. The KBD-I remains in the shifted mode with a *single* keystroke, while exiting from the shifted mode with a second (left or right!) keystroke entry.

The KBD-I simplifies integrating your computer system into a professional or business application. The compact size of the KBD-I permits easy portability, its brushed aluminum black anodized cabinet is a cautious blend of attractive design and the highest quality engineering and manufacturing techniques.

SMART ™ features
Patent Pending

FEATURES

- 'SMART™' shift function
- Tactile feedback
- 59 keys (with left and right shifts)
- Standard (QWERTY) typewriter format
- Silk screen labels compatible with Sinclair/Timex keyboard
- Compact design
- Rugged yet attractive black anodized aluminum cabinet
- Simple installation
- Custom engineered for Sinclair/Timex computers
- Auto-repeat function (fast/slow modes)

SPECIFICATIONS

Contact resistance: 20Ω @ 1mA
Contact rating: 1.0V/A
Contact bounce: ⩽5.0mSec.
Switch life: 5.0×10^6 operations typical
Switch force: <9.0 oz.
Switch travel: .015 in.

MAIL ORDER TO:
SYNERGISTIC DESIGN
P.O. BOX 411023
CHICAGO, ILLINOIS 60641

*Illinois residents include 6% sales tax.

	PRICE	QTY.	AMT.
SYSTEM LOGIC KBD-I KEYBOARD	**$85.95***		
Shipping and handling (per unit)	**$ 4.95**		**$ 4.95**
Money order or check		TOTAL	

NAME_____

ADDRESS_____

CITY_____ STATE_____ ZIP_____

sync notes

Paul Grosjean

SYNC in the Classroom

In the wake of the recent federal budget cuts in education *SYNC* has been receiving inquiries from teachers and school administrators about the Sinclair computer. The question they ask most frequently concerns the Sinclair as an alternative to the larger popular computer systems. They are interested in the fact that for the price of one of the popular systems they can get several Sinclair computers with 16K RAM packs and provide hands-on experience to several students instead of just one. For the price of several large computers a whole class could be equipped with the Sinclair computer. So a school system even with sharp budgetary constraints does not have to cut back on basic computer literacy programs; it could even initiate such programs.

Another question they often ask concerns the availability of educational software. Since the ZX80 and ZX81 were introduced to the United Kingdom market some months before they were available here, most of the educational software available is from U.K. sources. Some U.S. software suppliers have made arrangements to distribute U.K. software here.

SYNC has received a number of articles which suggest some of the educational uses of the Sinclair computers, and we have gathered some of these for our theme section "SYNC in the Classroom." These articles deal with a variety of levels from pre-school up.

Two major characteristics show up in the articles we have received. First, the main focus of most is math. Perhaps this is natural; after all, a computer does compute. We will be using some of these in future issues. Second, many articles use the computer as a substitute for a pencil and scratch paper. Certainly this is one use, and it is an important one where the computations are extremely lengthy and tedious. However, it seems hardly worth the trouble to load a tape to do something that a pencil and paper will do more quickly. Since such programs are not difficult to write, they tend to appear first.

At the present the computer seems to be more of a novelty in the classroom than an integral tool in the learning process. There are three main obstacles to classroom computer use. First, the most serious obstacle is that we do not yet have enough teachers with computer training to use the computer as a teaching tool. It seems frequently that the computer is assigned to the math department which is expected to either have or get the expertise to use it. Like other equipment which requires some study and work to use the computer may be in danger of being relegated to the closet when the enthusiasm of the administration for getting on the computer bandwagon wears off.

GAMES PACK

Beat this for value! Five 16K programs Plus two 1K programs

3-D Battle (M/code - 1K)
City Bomb (M/code - 1K)
Warp Wars (Basic & M/code - 16K)
Snake (Basic 16K)
Sweet Tooth (Basic & M/code - 16K)
Slalom (Basic 16K)
Black Holes (Basic 16K)

ALL ON ONE CASSETTE FOR ONLY $9.90 (£4.95)

NEW **BATTLESHIPS & CRUISERS GAME**
(16K - ZX81)
First computer version of this popular game of strategy and tactics. Both grids on view together. Establish the position of your fleet then locate and destroy the computer's fleet. Visual display shows hits and misses made and gives running score.

ONLY $9.90 (£4.95)

An Essential addition to your 16K RAM ZX81

TOOLKIT (written by Paul Holmes)
Provides the following additional facilities:-

Line renumber - you state starting number and increment value.
GOTO's and GOSUB's included in line renumber.

Search and List - Searches for and lists every line containing specified character.

Search and replace - changes every occurance of a character as you require.

Free space - tells you how many free bytes you have left.

SPECIAL GRAPHICS ROUTINES

Hyper graphics mode -graphics never seen on a ZX81 before.

Fill - fills your screen instantly with your specified character.

Reverse - changes each character on your screen to its inverse video.

TAPE ROUTINE - provides a system WAIT condition until a signal is received in the cassette ear jack.

All these routines are written in machine code and together take up only 1K of your precious RAM - an incredible achievement!!

FOR 16K *ONLY $9.90 (£4.95)*

NEW **GRAPHICS TOOLKIT** (another masterpiece by Paul Holmes) **(ZX81 - 16K RAM ONLY)**

22 exciting MACHINE CODE routines that give you control over your screen as never before!

Draw/Undraw draws or deletes your multi-character shape which is defined in a REM statement. You may define as many different shapes as you like and draw or undraw each at will at whichever screen position you choose.

Foreground On/Off use this to 'protect' existing characters on your screen. When on new shapes will appear to slide behind and re-emerge from other shapes.

Border/Unborder Draws a border round the edges of your screen area. Edit lines can be used if required. Your border is protected when foreground is on.

Fill Fills any number of lines you specify, starting at any line you specify, by your chosen character.

Reverse Converts all characters to their inverse video, control as in FILL.

Print Position Controls
UP, DOWN, LEFT, RIGHT - alter your next PRINT position in the direction indicated

Editprint Moves next PRINT position to first edit line.

Scroll facilities
UPSCROLL, DOWNSCROLL, RIGHTSCROLL, LEFTSCROLL - Scroll your screen in the direction indicated

Onscreen/Offscreen turns your screen on or off.

Background On/Off Fills your screen by your specified character. When foreground is on existing information is unaffected and shapes will appear to pass in front of your background, without deleting it.

Search and Replace will search the screen for every occurrence of the character you specify and replace it with your new character.

Square draws a square or rectangle from your specified co-ordinates.

All these routines are in machine code for SUPER-FAST response! Simply load GRAPHICS TOOLKIT, which repositions itself at the end of your RAM, and then your own program (or key in a new one), GRAPHICS TOOLKIT uses only 2K of your RAM and that includes space to load the programmers TOOLKIT described above.

ALL FOR ONLY $11.90 (£5.95)

This includes a cassette with 2 copies of the program, 2 copies of a demonstration program, plus a comprehensive instruction booklet with examples.

PLEASE NOTE ALL PRICES ARE FULLY INCLUSIVE AND ARE APPLICABLE FOR EXPORT. INCLUDING AIRMAIL POSTAGE PAYMENT MAY BE MADE IN STERLING (MONEY ORDER AVAILABLE AT YOUR BANK) OR YOUR OWN U.S. CHEQUE. MADE PAYABLE TO *IRS SOFTWARE* DESPATCH NORMALLY 7 DAYS FROM RECEIPT OF ORDER

IRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX. BN13 3JU Telephone: (0903) 65891

THE EXPLORER'S GUIDE TO THE ZX81

If you have ZX81 then you need this book (120 Pages).

1K and 16K Programs.
Games and Application.
RAM and I/O Circuits.
Programming Hints
ROM Routines.

$11 from:

TIME DATA
3 - Waldon Road
Califon, N.J. 07830

Enclosed _____ Check/M.O.
Name _____
Address _____
City _____ State _____ Zip ___

N E W !

From Intercomputer

A
Full Line
Of
Business
Education
And
Entertainment
Software

for your ZX81 or Timex Sinclair 1000

Please send me a FREE
Program and Catalog

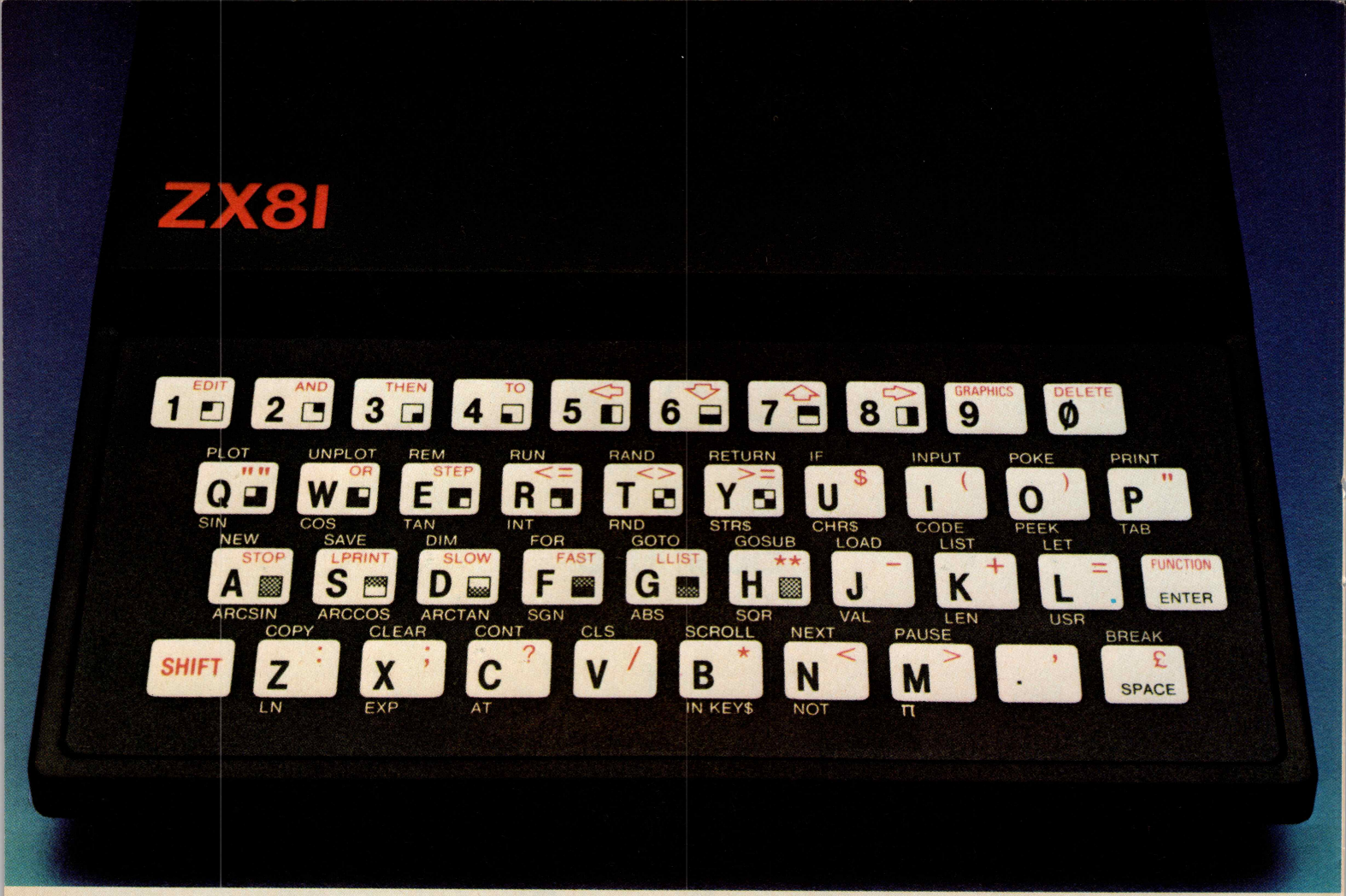
Name _____

Address _____

_____

_____

Send this coupon to:
Intercomputer
Box 90
Prudential Center
Boston, MA 02199



THE $99.95 PERSONAL COMPUTER.

Introducing the Sinclair ZX81.

If you're ever going to buy a personal computer, now is the time to do it.

The Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only $99.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers.

The ZX81 is a major advance over the original Sinclair ZX80 – the first personal computer to break the price barrier at $200.

In fact, the ZX81's 8K extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- 1K of memory expandable to 16K
- A comprehensive programming guide and operating manual

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. It comes with a comprehensive programming guide and operating manual designed for both beginners and experienced computer users. And you can use a regular cassette recorder to store and recall programs by name.

Sinclair technology is also available in Timex/Sinclair computers under a license from Sinclair Research Ltd.

Order at no risk.**

We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

Introducing the ZX81 kit.

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just $79.95.* It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

A leader in microelectronics.

The ZX81 represents the latest technology in microelectronics. More than 10,000 are sold every week. In fact, the ZX81 is the fastest selling personal computer in the world.

We urge you to place your order for the ZX81 today.

To order.

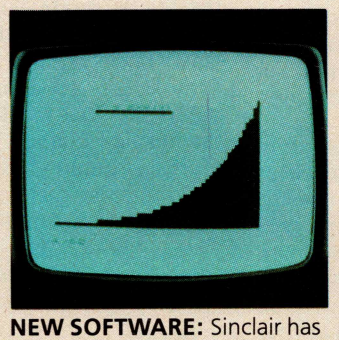
To order, simply call toll free. Or use the coupon below. Remember, you can try it for 10 days at no risk.** The sooner you order, the sooner you can start enjoying your own computer.

Call toll free 800-543-3000.

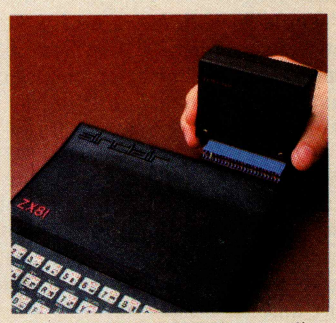
Ask for operator #509. In Ohio call: 800-582-1364; in Canada call: 513-729-4300. Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your MasterCard or VISA ready.

These numbers are for orders only. If you just want information, please write: Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.
**Does not apply to ZX81 kits.



NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81. Cost is $49.95, plus shipping and handling.

sinclair

To order call toll free: 800-543-3000

Ad Code 09SYOS	Price*	Qty.	Amount
ZX81	$99.95		
ZX81 Kit	79.95		
16K Memory Module	49.95		
Shipping and Handling	4.95		$4.95
		TOTAL	

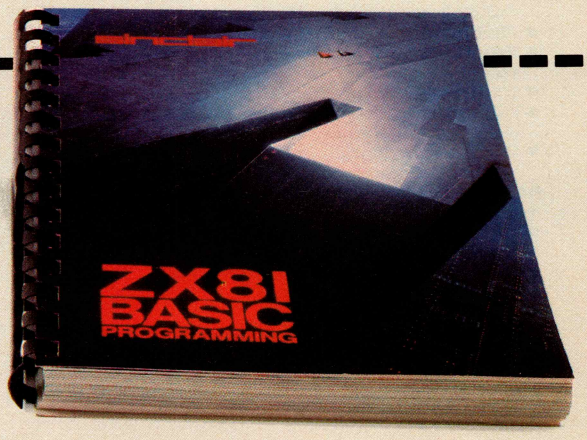
MAIL TO: Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

Name_____

Address_____

City_____ State_____ Zip_____

*U.S. dollars



Second, some teachers are afraid of it and will resist its use. This is partly because some students are already far ahead of them in computer mastery, and we adults have a hard time accepting the fact that an elementary school student can know more than we do about a subject that everyone *knows* is difficult to master.

Third, some schools restrict the use of their computers to advanced students. This is unfortunate because the idea is encouraged that computers are only for "special" students, not for "ordinary" students. Above all, the computer is not integrated into the total school curriculum as a tool with a contribution for each area.

The serious use of the computer in education depends upon having teachers trained to use it in their particular fields, software exploiting the computer's capability for interaction with the student, and an openness to a new tool for teaching and learning.

How is the computer being used in your local school system?

ROMs and RAMs

Readers have requested that we publish 8K ROM translations of the programs we published before the 8K ROM was introduced. We are including some of these translation in "8K ROM Updates" elsewere in this issue. We have also been asked to publish programs for the ZX80 with the 8K ROM.

We specify the ROM and RAM requirements on all programs and articles where these are necessary, but we do not specify the machine as such.

The 4K ROM programs will work on the ZX80 and the MicroAce; The 8K ROM programs, on the ZX81 and the ZX80 with the 8K ROM. However, since the SLOW mode cannot be accessed on the ZX80 with the 8K ROM, programs which must be run in SLOW mode require some slight modification. The SLOW mode functions to allow the viewer to see the display change. Usually the action graphics routines have two basic parts: 1) putting a new picture on the screen, and 2) taking it off. On the ZX80 with the 8K ROM you can use a PAUSE between these two parts to allow you to see the change. For example,

```
10 LET J=1          Initialize
20 LET I=1          variables
30 PLOT I,J         "Prints" picture
40 UNPLOT I,J       Removes picture
50 LET J=J+1        Adjusts variables for
                    new picture
60 GOTO 30          Loop back to "print"
                    new picture
```

For the ZX80 with the 8K ROM you would add

35 PAUSE (number, e.g., 10)

The number determines the length of the PAUSE. In the U.S. 60 equals one second; in the U.K. 50 equals one second.

Generally our authors write their programs on one specific machine. We request our authors to supply the listings or modifications necessary for the users of the other ROMs and machines; on occasion we modify or translate a program. The ROM in parentheses indicates such a translation or adaptation.

Since 8K ROM programs are virtually identical we have not made separate listings for the ZX80 users.

Some readers have also asked concerning the RAM designations. These RAM designations (usually in the upper right or left corner of the first page of an article) do not refer to the length of the program, but to the amount of RAM your machine must have to run the program. Many programs designated 16K require much less than 16K RAM, but, since most users and authors have 1K, 2K or 16K RAM, we do not specify intermediate RAM levels. When a RAM designation appears in parentheses, we mean that modifications of the basic program are provided for use with that much RAM. ■

Get on the Control Bus for only $49.95 round trip ... and be on TIME.

With our real Time Clock and Calendar

8 lines departing
(outputs capable of driving relays)
8 lines arriving
(T T L compatible inputs)

TIME MONTH DATE YEAR DAY OF WEEK
23:59:59 12 - 31 - 99 - 7

- **Leap year correction**
- **12/24 hour format**
- **± 30 second time correction (hardware or software)**
- **Battery back-up circuit**

Comes complete with:
- All software needed to operate clock and Input/Output ports
- On board 5 volt regulator.
- Feed through Sinclair Bus connector to allow normal expansion.
- Each port is expandable through Multiplexing.
- I/O ports and other controls mate with Radio Shack™ 44 pin edge socket.
- 90 day Warranty

Accessories used with I/O Board:
- A to D and D to A converter
- Wireless control system compatible with BSR™ modules
- Solid state 25 amp switch modules
- 8 SPDT 5 amp relay card

Future products used with I/O board:
- Touch Tone™ encoder/decoder and other telephone products
- Speech synthesizer
- Sound synthesizer

Compatible with ZX80/81 MicroAce & TIMEX™ 1000
All accessories can be connected together and separately controlled from the I/O parts

Model	Description	Price
310	I/O port with real time clock **(Built and tested)**	$49.95
315	PC board and manual of #310	$24.95
320	A to D and D to A converter **(Built and tested)**	$39.95
325	Bare A to D and D to A board and manual	$19.95
330	Wireless control system **(Built and tested)**	$44.95
340	Solid State™ AC switch **(Built and tested)**	$19.95
350	Relay board **(Built and tested)**	$69.95
317	Clock IC and crystal **(Tested)**	$12.95
	Shipping and handling	$ 3.95

Orders accepted by phone or mail. California residents add 6% tax
For mail orders, send check or money order.
Foreign orders must be in U.S. currency.

write for free catalog

JK AUDIO

P.O. Box 3295
Escondido, CA 92025-0580
Information (714) 741-5132
24 HOUR ORDER LINE
NAT. 800-227-1617
Calif. Res. 800-772-3545
Ask for operator 367

VISA MasterCard

Make Your Sinclair Work Harder, Better...

with quality, affordable and dependable peripherals from CAI.

The Interface

The CAI/O Board® plugs into the computer's expansion port and is the interface that lets your computer communicate with the outside world.

There is a serial RS-232 compatible I/O port, 3 parallel I/O ports used to design circuits to control home lights, power relays and additional ports to accept printer, mass storage device and memory expansion.

$79.95 when purchased separately

$69.95 when purchased with CAI peripherals

The Printer

New! The CAI/P40 prints the complete library of regular and inverse alpha-numerics and graphics in 40-column width. Three user-addressable modes print in regular or enhanced (double type size): List program from memory, print text or data from program, print screen

$139.95 complete stand alone printer. (can be upgraded to use with other CAI peripherals)

$119.95 requires CAI/O Board for complete compatibility with other CAI peripherals

Mass Storage Device

CAI introduces the Stringy Floppy® for the Sinclair or Timex Sinclair. It has the speed of a disc drive at a fraction of the price. Data is stored on an inexpensive continuous loop magnetic tape cassette. This device inputs and outputs data at an incredible 14,000 baud - - 56 times faster than Sinclair cassette recorder interface.

The system is designed to accommodate two Stringy Floppy drives for even more versatility.

$109.95 per drive
Requires CAI/O Board

Computer Network Package

This package consists of ASCII conversion program, phone modem, connecting cable. Now you can communicate with large main frame computers, micro-and mini-computers and computer networking systems (The Source®).

$149.95 Note: Order this package when ordering your CAI/O Board.

$24.95 for ASCII conversion program only

Additional Peripherals

Memopak® 64K memory expansion
$159.95

Programs:

$14.95 **Home Finance**

$9.95 **Math Tutorial**

$9.95 **Stocks**

$9.95 **Wiz Bang Math**

$7.95 **Bio Rhythms**

Why buy from CAI?

All CAI peripherals come with complete instruction manuals, schematics and a 30-day unconditional replacement warranty. Each works with either the Sinclair ZX-80, ZX-81, MicroAce and Timex/Sinclair 1000.

Our technicians are happy to answer your questions before and after purchase.

CAI Instruments, Inc.
P.O. Box 2032
Midland, MI 48640

Phone: (517) 687-7343 Office Hours: 9:00 a.m. — 4:30 p.m.
Evening Hours (Technical Information) 6:00 p.m. — 8:30 p.m.

Orders accepted by phone or mail. For mail orders, send check, money order, VISA or MASTERCARD numbers. Foreign orders must be made in U.S. currency.

Quantity	Description	Unit Price	Total
	CAI/O Board	(See Price)	
	CAI Printer	(See Price)	
	Stringy Floppy	$109.95	
	Other		
SUBTOTAL			
	Shipping and Handling		
	4% Sales Tax (Michigan Resident Only)		
	TOTAL		

☐ Literature, enclose $1.00

SHIPPING AND HANDLING CHARGES
Within U.S. $5.00 Outside U.S. — F.O.B. Midland, MI

MasterCard/Visa _____
Exp. Date _____
Name _____
Address _____
City _____ State _____ Zip _____
Phone No. _____

8K ROM; 1K RAM
4K ROM; 1K RAM

try this

4K ROM

Enter the following program.

```
10 FOR A=38 TO 63
20 FOR B=38 TO 63
30 FOR C=38 TO 63
40 PRINT CHR$(A);CHR$(B);CHR$(
C);"#";
50 NEXT C
60 NEXT B
70 NEXT A
```

Hit RUN and NEWLINE. When the screen is full, press NEWLINE, CONTINUE, and NEWLINE. Repeat this process until you have completed the sequence. The same program can be entered on the 8K ROM, and you might want to add the line: 45 SCROLL. Our thanks to:

A. Dan Klyver
29 Old Stagecoach Rd.
Weston, CT 06883

8K ROM

Enter the following program. For the graphics, use the graphic on the key indicated the number of times in ():

10 E (1), 7 (10), R (1).
20 5 (1), 10 spaces, 8 (1).
30 W (1), 6 (10), Q (1).
50 10 spaces, A$, 10 spaces.

```
 10 PRINT AT 9,10;"
"
 20 PRINT AT 10,10;"
"
 30 PRINT AT 11,10;"
"
 40 INPUT A$
 50 LET A$="          "+A$+"
 60 LET B=LEN (A$)-10
 70 FOR X=1 TO 8
 80 PRINT AT 10,11;A$(X TO X+9)
 90 NEXT X
100 GOTO 70
```

Be sure that you are in SLOW mode, hit RUN and ENTER. After the display appears, type in your name and press ENTER. Observe the results. Our thanks to:

Mark Kluth
143 Humphrey Circle
Shawano, WI 54166

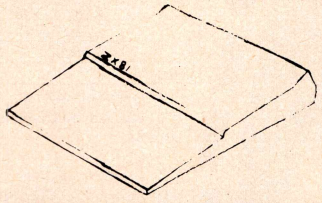
Enter the following program very carefully. Any underlined letters indicate that you should use the graphics on that key. The underlined tokens and keywords should be entered directly from the keyboard and not spelled out. If a given keyboard entry will not enter, hit THEN, the keyword, backspace and delete THEN, go forward again and continue typing in the program.

```
 10 REM <>E£RND1£#<>DT3<>Q#O<>
FAST VAL 11#LN P?AT <> LPRINT <>
Q##<>7( CONT T3<>Q#O<> FAST VAL
11#LN P?AT <> LPRINT <>Q##<>F( C
ONT /ASN
 20 PRINT AT 11,31;"#"
 30 LET S=USR 16514
```

After entry is complete, SAVE on cassette. Then be sure that you are in FAST mode, press RUN and ENTER and watch what happens. Our thanks to:

Scott Laska
2205 Calumet Dr.
New Holstein, WI 53061

16K INSIDE?!!



No Bulky Add-ons!
Leaves back connector free for printer or peripherals!
Inexpensive using your parts.
Can be assembled and installed by anyone who can use a soldering pen. Complete instructions, including schematic, parts list, suggested Board layout, assembly and installation. $7.95
With optional pre-made P.C. Board, ready for assembly. $18.95 from:

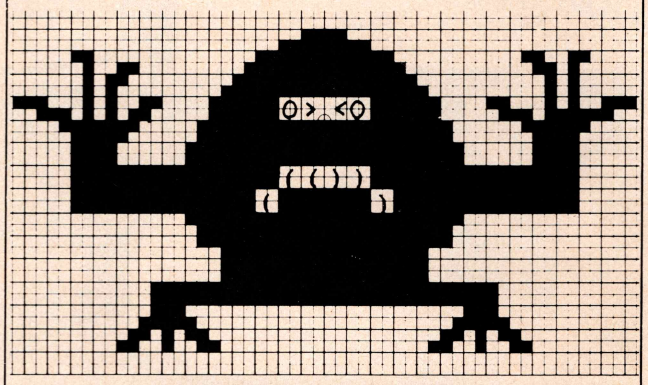
Independence Research
P.O. Box 1497
Orem, Utah 84057

PROGRAM FASTER!

Now you can write and revise program listings faster than ever before. Never again count spaces for PRINT, PRINT AT, and PLOT functions. ROMARK SCREEN PADS are a larger, improved version of the ZX Basic Hand Book (page 89) showing line, column, and pixel numbers. We use heavy eraseable paper, 50 sheets per pad.

FIVE SCREEN PADS (250 Sheets) $7.95
Shipping and Handling 1.50

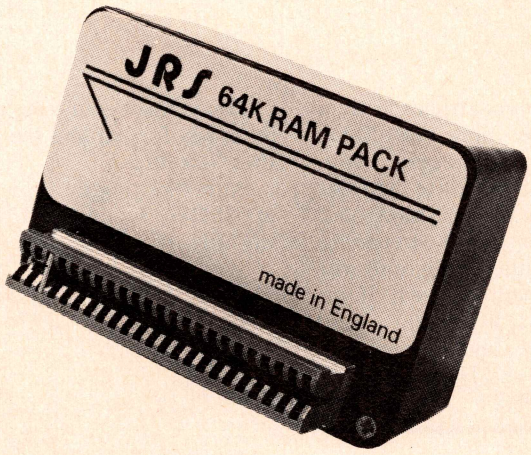
Send S.A.S.E. for information on math programs, "Leadfoot" anchor pads, and "Solid Jack" sockets.



ROMARK INDUSTRIES, INC.
20412-29 CENTER RIDGE RD.
CLEVELAND, OHIO 44116

Now available in the U.S. at the incredible price of only $119.95 (£62.95)

ACTUAL SIZE 3" × 2"



THE 64K RAM PACK

- Fully built, tested and guaranteed.
- No additional power supply required.
- Black plastic case no larger than 16K RAM PACK.
- No wobble problems
- Fully compatible with printer etc.

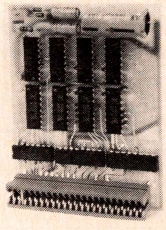
The use of this memory is as follows:-

0 – 8K	Sinclair ROM
8 – 16K	RAM that is unaffected by NEW, LOAD, SAVE and can be used for storing machine code routines.
16 – 32K	BASIC Code, Display file, Variables, Machine Code
32 – 64K	Variables

ALSO AVAILABLE

16K RAM PACK at only $49.95 (£29.95)
including *FREE ALIEN ATTACK (7K -M/code)* — value $11.00 (£5.75)
As reviewed in 'Your Computer' — (March 1982) the leading U.K. Sinclair Publication. Almost 10.000 units sold in the U.K. so far.

THE 'NO FRILLS' ECONO TECH 16K RAM PACK ONLY $39.95 (£20.95)
We believe the Econo Tech is the lowest priced 16K RAM available anywhere.
No frills - just a reliable and economical way to expand your ZX81.
As reviewed in 'ZX Computing' August/Sept 1982, the new U.K. ZX computer publication. Available ONLY from JRS.



PLEASE NOTE: All prices are fully inclusive and are applicable for export, including airmail postage. Payment may be made in sterling (Money Order available at your bank) or your own U.S. $ cheque, made payable to JRS SOFTWARE.
Despatch normally 7 days from receipt of order

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX. BN13 3JU Telephone: (0903) 65691

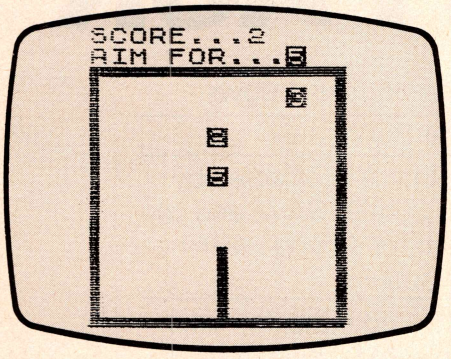
8K ROM
1K RAM

just for fun

Generally *SYNC* prefers articles in some depth to help you get more out of your computer. However, we receive many short programs that illustrate a point, demonstrate a technique, or show something the reader has found interesting. "Just for Fun" shares these programs with you. If you learn something, great. If you have some fun, great. If you have some that you want to share, send them to: Just for Fun, SYNC, 39 E. Hanover Ave., Morris Plains, NJ 07950.

Zap

M. Hampson



You are a laser zapper on a space cruiser on routine patrol when suddenly your ship is under attack. Each of the attackers is assigned a number, and each zapper is assigned a target. A target number appears on your screen, and you must destroy that target and only that one. Your performance as a zapper is measured by the score you achieve. Each assigned target hit is worth one point. Your rating as a zapper is the score you achieve. The higher the score, the higher your rating will be. If you shoot at a target you have not been assigned, you get no points. Furthermore, you will have wasted a shot and the next assigned target appears.

You control your laser movement with the 5 key for left and the 8 key for right. Press 0 to fire.

Enter the program, put the computer in SLOW mode, and hit RUN and ENTER.

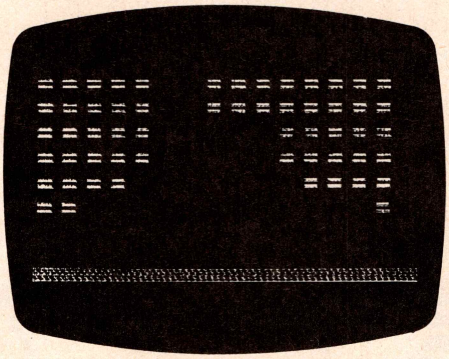
```
 10 FOR Z=VAL "0" TO VAL "25"
 11 PLOT Z,VAL "0"
 12 PLOT Z,VAL "25"
 13 PLOT VAL "25",Z
 14 PLOT VAL "0",Z
 15 NEXT Z
 20 LET P=VAL "1"
 30 LET S=VAL "0"
 40 PRINT AT VAL "7",P-P;"SCORE
...";TAB P-P;"AIM FOR..."
100 FOR N=157 TO 165
101 LET Q=INT (RND*11)*2+1
102 UNPLOT Q,INT (RND*20)+3
103 PRINT CHR$ N
104 PRINT AT 8,10;CHR$ N
105 FOR Z=0 TO 25
110 UNPLOT P,1
120 LET P=P+(INKEY$="8")-(INKEY
$="5")
130 PLOT P,1
140 IF INKEY$<>"0" THEN GOTO 15
5
145 IF P=Q+1 OR P=Q+2 THEN LET
S=S+1
150 FOR Z=2 TO 24
151 PLOT P,Z
152 NEXT Z
153 FOR Z=2 TO 24
154 UNPLOT P,Z
155 NEXT Z
156 PRINT AT 7,8;S
160 NEXT N
```

Blaster

M. Hampson

In Blaster the screen displays a field showing a wall of 7 courses of equals signs. Your blaster, which is on continuous fire, is indicated by an asterisk. You have 200 shots to clear away the wall. The movement of your blaster is automatically to the right; to move it to the left you must press the 1 key. The score, showing the total number of hits, is displayed at the end.

Type in the program without using your RAM pack. Put the computer in SLOW mode, hit RUN and ENTER.



Graphics notes:
Line 4: Inverse equals sign (16).
Line 6: Inverse space (16); S (16).

```
  1 LET N=0
  2 LET B=501
  3 FOR Z=0 TO 6
  4 PRINT AT Z,0;"==============
==="
  5 NEXT Z
  6 PRINT "                ","
"
  7 LET P=8
  8 LET V=PEEK 16396+256*PEEK 1
6397
 10 LET B=B-1
 20 IF B=0 THEN GOTO 200
 30 LET P=P-1+(INKEY$="")*2-(P=
15)+(P=0)
 40 POKE 120+V+P,151
 60 FOR Z=120+V+P TO V STEP -17
 70 IF PEEK Z=148 THEN GOTO 110
 80 POKE Z,151
 81 POKE Z,128
 90 NEXT Z
100 GOTO 10
110 POKE Z,128
120 LET N=N+1
130 IF INT (N/112)<>N/112 THEN
GOTO 10
140 GOTO 3
200 PRINT "YOUR SCORE ";N
205 PAUSE 50000
210 CLS
215 RUN
```

Catch 25, or Playing Left Field

M. Hampson

Your catching glove (or cup or whatever you want to catch with) appears as a U. The ball comes down and you must move to catch it in your glove. You move into catching position by using all the arrow keys so this requires simultaneous four finger coordination. When you catch the ball, a shift in graphics to the asterisk indicates a successful catch. Your score, which is the total of successful catches, is displayed in the top center of your screen throughout the game.

Type in the program. Put your computer in SLOW mode, hit RUN and ENTER.

Graphics notes:
Line 120: a period.
Line 150: the letter U.
Line 200: an asterisk.

```
 20 LET Q=VAL "10"
 30 LET R=Q
 40 LET S=Q-Q
100 FOR Z=Q/Q TO VAL "25"
105 LET P=INT (RND*VAL "10")
110 FOR L=Z/Z TO VAL "17"
120 PRINT AT L,L+P;" ";AT L+Z/Z
L+P+Z/Z;"."
130 PRINT AT Q,R;" "
140 LET Q=Q+(INKEY$="6")-(INKEY
$="7")
141 LET R=R+(INKEY$="8")-(INKEY
$="5")
150 PRINT AT Q,R;"U"
160 IF L+Z/Z=Q AND L+P+Z/Z=R TH
EN GOTO VAL "200"
170 NEXT L
180 NEXT Z
190 STOP
200 PRINT AT Q,R;"*"
210 LET S=S+Z/Z
220 PRINT AT Z/Z,VAL "11";S
230 GOTO VAL "180"
```

M. Hampson, 7 Hereford Dr., Clitheroe, Lancs BB7 1JP, U.K. Reprinted from *The Ultimate Magazine* with permission.

Neil Dewhurst, 2 Chesterbrook, Ribchester, Nr. Preston, PR3 3XT, U.K. Reprinted from *The Ultimate Magazine* with permission.

EZRA GROUP II
EZRA GROUP II

The ZX81/80/TS-1000'S are making a name
with LOW prices...

WE CHALLENGE THE SOFTWARE COMPANIES TO LOWER THEIR PRICES!

For TS-1000/ZX81/ZX80/8K ROM
1K and 16K RAM versions

Biorhythms	1.00
Graphics Billboard	1.00
Horse Race	1.00
SPINNER T.M. (like Rubik's) 16K	2.00
Skew-a-Sketch (like Etch)	1.00
Improved Pause (ZX81)	1.00
Linear Regression	2.00
CHEWTER T.M. (Like Pac M-N) SLOW	2.95
Shootist	2.00
Random MUSIC! SLOW	2.00

Self Addressed Stamped Envelope
Gets YOU our Goodies Catalog

ALL ORDERS AND CATALOG REQUESTS GET **FREE**
Galactic Messages PROGRAM.

EZRA GROUP II
EZRA GROUP II

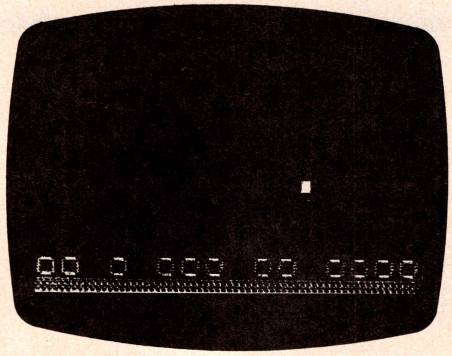
P.O. Box 5222 San Diego, California 92105 (714) 584-8291

Bombs Away!

Neil Dewhurst

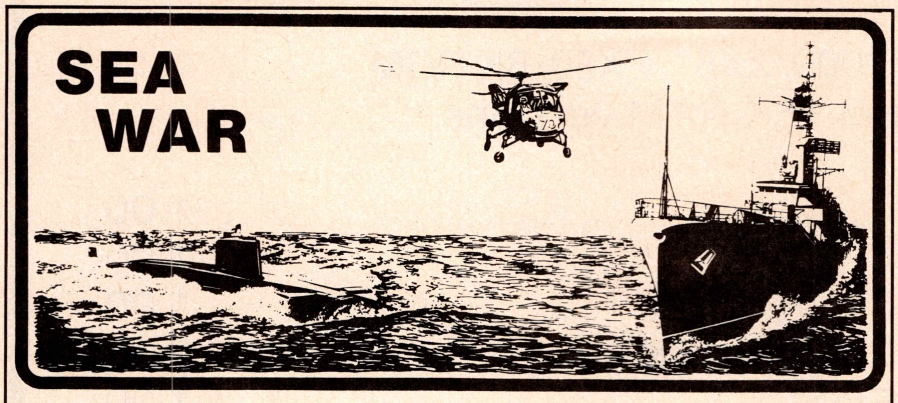
Your high speed bomber appears at the top of the display as the inverse and moves from left to right. Your targets appear at the bottom of the display as inverse O's. Press any key to drop a bomb at any time. Each time the plane makes a pass over the target area, it drops down closer to the targets. The aim of the game is to hit all the O's before the plane gets too low to make another pass.

Enter the program, put your computer in SLOW mode, press RUN and ENTER.



Graphics notes:
6: inverse space (16).
10: inverse O (16); S (16).
120, 310: inverse
140, 280, 400: inverse spaces.
145: Q.

```
  5 FOR Z=VAL "1" TO VAL "8"
  6 PRINT "                "
  7 NEXT Z
  8 CLEAR
  9 LET B=VAL "0"
 10 PRINT "                ",,"
                "
 100 FOR P=VAL "0" TO VAL "7"
 110 FOR Q=0 TO 15
 120 PRINT AT P,Q;"■"
 125 IF B THEN GOTO 140
 130 IF INKEY$="" OR P=7 THEN GO
TO 150
 131 LET R=P
 132 LET S=Q
 133 LET B=1
 140 PRINT AT R,S;"■"
 141 LET R=R+1
 142 LET S=S+1
 143 IF S>15 THEN LET S=0
 145 PRINT AT R,S;"■"
 146 IF R=8 THEN GOSUB 400
 280 PRINT AT P,Q;"■"
 290 NEXT Q
 299 NEXT P
 300 FOR Q=0 TO 15
 310 PRINT AT P,Q;"■"
 320 IF 128<>PEEK (PEEK 16398+25
6*PEEK 16399) THEN STOP
 330 NEXT Q
 340 STOP
 400 PRINT AT R,S;"■"
 410 LET B=0
 420 RETURN
```

SEA WAR
FOR ZX81

This game is designed for one or two players. Each player has three submarines. As a certain number of points are reached, bonus submarines will be given. When the game is going on, the higher the score you get, the more that hostile features will appear on the screen.

The features which appear on the screen are as follows:
Submarine, Warship, U-boat and Helicopter.

Submarine

This feature is under your own control and is loaded at the left hand side of the screen. The keys '9' and '0' are the firing buttons for the upward missiles and forward missiles respectively.

The submarine can be moved in four directions; it can move upwards and downwards by pressing keys '7' and '6' respectively. In order to move forward, you press key '8' and it will draw back to its previous position when you release the button. Also, the submarine can be moved diagonally upwards or downwards by pressing both keys '8' and '7' or keys '8' and '6' respectively at the same time.

U-boat

This is the hostile submarine: It drifts under the sea level randomly, from right to left. Missiles are fired as it approaches your submarine. Destroying a U-boat scores 20 points.

Warship

This is the enemy destroyer which will release bombs diagonally as it drifts on the sea surface from right to left.

The destruction of a warship is done by either firing a vertical missile or, when the submarine is just under sea level, by pressing keys '7' and '0' which release a horizontal missile. Otherwise the missiles will just pass under the ship bottom. Each destruction of this feature scores 50 points.

Helicopter

As you reach a certain score, helicopters appear on the left hand corner of the screen; they drop vertical bombs as they hover above the submarine. To destroy the helicopters, vertical missiles can be fired by pressing key '9'. Each helicopter destroyed scores 100 points.

*New Game—ADDER—Arcade-type game.
Shoot the numbers as they pass across the screen, but watch your total.

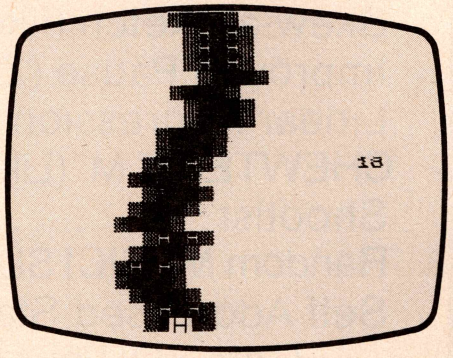
Each game $9.95 plus $2.00 postage/handling
Distributor Inquiries Welcome

Panda Software,
51 Elgin Street, Shelton
Stoke-on-Trent ST4 2RD

Grand Prix

Neil Dewhurst

You have just entered the 1K Grand Prix. The black-topped track scrolls as you drive your white "H" car toward the finish line. You steer by the Z and M keys. You must avoid hitting the parked cars and running off the road. If you do crash, the race ends and your odometer



reading appears. Each line scrolled adds one to your reading. The aim of the race is to drive as many miles as possible.

Enter the program, put your computer in SLOW mode, press RUN and ENTER

Graphics notes:

Line 40: Inverse H.

Line 50: Inverse space.

Line 60: A; inverse space; A; inverse space.

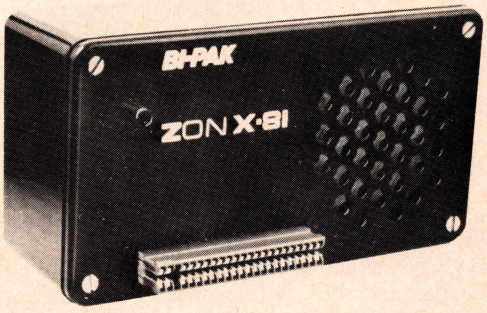
```
  5 LET F=VAL "-12"
 10 LET P=VAL "10"
 20 LET R=VAL "7"
 30 PRINT AT 10,P;"H"
 40 LET G$="■"
 45 LET F=F+1
 50 IF RND>.3 THEN LET G$="■"
 55 SCROLL
 60 PRINT TAB R;"■";G$;"■";G$;"
■";AT 9,P;" " AND F<=0;"■" AND F
>0;AT 10,P;
 70 IF R>2 THEN LET R=R-2*RND
 80 IF R<10 THEN LET R=R+2*RND
 90 LET P=P-(INKEY$="Z")+(INKEY
$="M")
100 IF PEEK (PEEK 16398+256*PEE
K 16399)=128 OR F<0 THEN GOTO 30
110 PRINT TAB 20;F
```

SOUND with ZX-81!

SOUND with ZX-81!

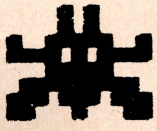
MAKE AMAZING SOUND EFFECTS WITH YOUR ZX-81

Timex Sinclair 1000



$49.95
Incl. airmail postage

THE ZON X-81



* The ZON X-81 SOUND UNIT is completely self-contained and especially designed for use with the ZX-81. It just plugs in—no dismantling or soldering.
* No power pack, batteries, leads or other extras.
* Manual Volume Control on panel—ample volume from built-in loudspeaker.
* Standard ZX-81—16K Rampack or printer can be plugged into ZON X-81 Sound Unit without affecting normal ZX-81 operation.
* Huge range of possible sounds for games or: Music, Helicopters, Sci-Fi, Space Invaders, Explosions, Gun-shots, Drums, Planes, Lasers, Organs, Bells, Tunes, Chords, etc., or whatever you devise!
* 8 full octaves. Uses 3-channel sound chip giving programme control of pitch, volume of tones and noise, all with envelope control.
* Easily added to existing games or programmes using a few simple "BASIC" lines or machine code.
* No memory addresses used—I.O. mapped.

FULL Instructions with many examples of how to obtain effects and the programmes, supplied. Fully Guaranteed.

Payment may be made by Bank Cheque or International Money Order in U.S. $ or £ Sterling Payable to:

BI-PAK

P.O. Box 6
Ware, Herts
England
Phone #0920-3182

Visa-Mastercard accepted
Send account #
with name & address

8K ROM
1K RAM

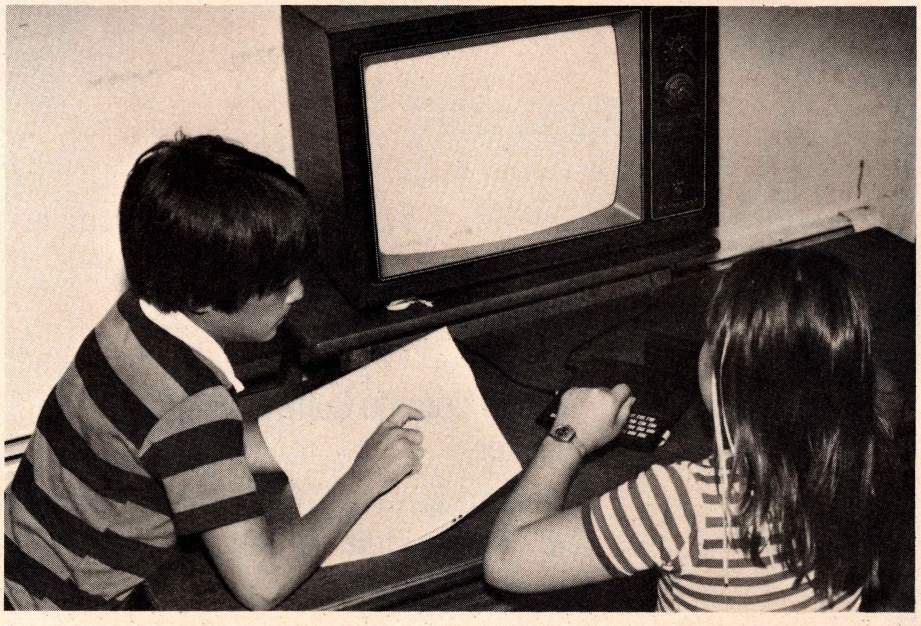
perceptions

David B. Ornstein

Parser Routines

This article is the third in a series discussing the ZX81 Parser. Since the first two articles (*SYNC* 2:3 and 2:4) may have been a bit too abstract for some readers, I hope this discussion will pull the previous articles together.

In the first article I covered the basic concepts common to all parsers, and in the second article I described the implementation of the parser in the 8K Basic ROM: the character fetch routines, the CLASS tables, and the executive routine that was responsible for controlling overall operations. In this article we will look at some of the routines that are called by the executive to perform actual operations. These operations include, but are not limited to, PLOTting a point on the screen, PRINTing a character on the screen, and executing a GOTO statement.



RUNning a Program in Basic

Before taking up the details of any particular command, let us review the method used by Basic to RUN a program. In the parser's executive routine a pointer must be passed to the line it is to execute. This pointer is passed to the exec(utive) in the system variable CH-ADD. A loop (at 066Ch in the new ROM) is responsible for keeping track of what line in the program we are currently executing and where it is stored in the computer's memory.

The way the computer stores a program in its memory is seen in Figure 1 which represents a single program line. The first two bytes of the line contain the line number of the represented line. These bytes are stored in MSB/LSB (Most/Least Significant Byte) order. This is the opposite of the standard practice with a Z80.

Figure 1: A Line Representation.

1	2	3	4	Text of Line	ENTER

The next two bytes hold a standard Z80 LSB/MSB 16-bit representation of the length of the line, including the ENTER (NEWLINE) at the end. When the program has more than one line, the computer is responsible for keeping the records that represent each line of the program in numerical order.

With the information supplied with each line, the computer has enough data to effectively "walk" through the program from one line to the next. This is accomplished by adding to the address of the first byte of the text in the line, and the length of the line, as specified in the two length bytes. The result of this calculation is the address of the next line in the program. Thus, the Run-Executive, as it will be referred to later, must perform only simple operations such as addition to RUN a program. A basic outline of the operations performed by the Run-Executive is as follows:

1) Load a variable (called NXTLIN) with 16509. This is the address of the first line of the program.

2) Set CH-ADD equal to NXTLIN.

3) Call the parser to execute the line.

4) If there are any errors currently logged, then stop, and report them, else,

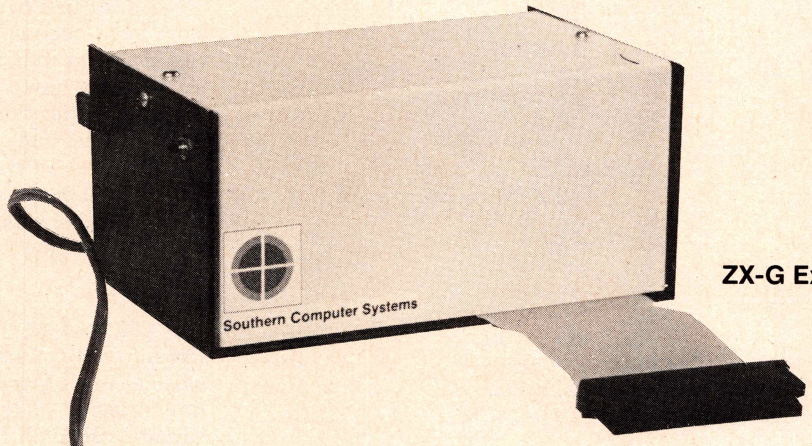
5) If the BREAK key is depressed, stop with a D report code, else,

6) Add to NXTLIN the length of the current line.

7) Go back to step 2.

Figure 2 gives the code for the Run Time Executive. Take a moment now to study it to get a general idea of what is transpiring. The essential facet of this routine is that, when a command handler is called by the parser, it can modify the NXTLIN pointer; this is, in fact, how a GOTO statement works. The destination of the line number (i.e., 100 in GOTO

Sinclair Hi-Res Graphics + 48K RAM + 8K EPROM Programmer



ZX-G Expansion Unit

Plug into Extended Use

Introducing Hi-Resolution Graphics for the Sinclair ZX-81
Now you can create detailed graphics images with the new, high quality, low cost **ZX-G Expansion Unit.**

Quality Graphics
The ZX-G gives your ZX-81 the ability to create memory-mapped graphics images with a resolution of 256 X 192 pixels.
— Graphics images can be drawn, moved, rotated, mixed with text, saved on cassette or printed.
— Excellent for Computer Aided Design, education and games.

Powerful Software! (cassette included)
— Generate lines, circles, and rectangles with ease!
— A dynamic graphics cursor facilitates rapid design.
— Graphics animation is fully supported!

Memory Expansion!
— With the ZX-G, you can expand the memory of your computer to 48K!
— Up to four hi-res. graphics screens can be stored in addition to a 16K program!

EPROM Programmer Support!
— With our optional EPROM programmer, (fully transparent), 2716 (8K) EPROMs can be programmed, verified and run directly in memory map (2000-3FFFH)

Compact Design!
— The total unit (including power supply) is enclosed in an attractive vinyl-clad aluminum case.
— Cable and power cord included!
— 90 Day Warranty (parts & labor)

ZX-G Expansion Unit **$99.95**

RAM/EPROM Option **$79.95**
(includes 32K RAM + four 2716 EPROMs, ZX-G required)

Free Graphics Software

Mail Order to:
Southern Computer Systems
630 Main Street
Shelbyville, Kentucky 40065
or call collect: (502) 633-5640

Figure 2. Listing of the Run Time Executive.

```
NEXT-LINE:
LD      (NXTLIN), HL
EX      DE,HL
CALL    TEMP-PTR            ;$004D
CALL    LINE-RUN            ;$0CC1
RES     1,(FLAGS)
LD      A, 11000000b
LD      (X-PTR),a
CALL    X-TEMP              ;$14A3
RES     5,(FLAGX)
BIT     7,(ERR-NR)
JR      Z,STOP-LINE
LD      HL,(NXTLIN)
AND     (HL)
JR      NZ, STOP-LINE
LD      D,(HL)
INC     HL
LD      E,(HL)
LD      (PPC),DE
INC     HL
LD      E,(HL)
INC     HL
LD      D,(HL)
INC     HL
EX      DE,HL
CALL    BREAK-1             ;$0F46
JR      C,NEXT-LINE
LD      HL,(ERR-NR)
BIT     7,(HL)
JR      Z,STOP-LINE
LD      (HL),$0C

STOP-LINE:
BIT     7,(PR-CC)
CALL    Z,COPY-BUFF
LD      BC,$0121
CALL    LOC-ADDR            ;$0918
LD      A,(ERR-NR)
INC     A
JR      Z,REPORT
CP      $09
JR      NZ,CONTINUE
INC     BC

CONTINUE:
LD      (OLDPPC),BC
JR      NZ,REPORT
DEC     BC
CALL    OUT-CODE            ;$07EB
LD      A,$18
RST     10
CALL    OUT-NUM             ;$0A98
CALL    CURSOR-IN           ;$14AD
JP      DISPLAY-6           ;$04C1
```

100) is evaluated, the address of that line is found, and then the calculated address is loaded into NXTLIN.

STOP

The STOP command is, as far as the driver code is concerned, the most elementary of all commands. The command handler for STOP is:

```
STOP:  RST 8
       .byte $08
```

The RST 8 routine will, when called, simply load into ERR-NR the byte given after the RST 8 instruction. In this case, the byte is a 08h. This number is the number-of-the-error-to-cause -1. If you review the code for the Run-Executive, you will see that, at the end of every line, it checks the ERR-NR byte. If the byte is not FFh, then the Run Executive stops and reports an error.

NEW

The NEW command is also a very simple command. When the computer is powered on, the BC register pair is loaded with 7FFFh, and a jump is made to the initialization routine. The initialization routine then fills every byte of memory from BC down to 4000h with a 2. It then goes back and decrements by 1 each of the aforementioned memory locations. As the computer decrements each location, it checks to be sure that the value obtained after the decrement was a 1. If it was not, then the computer has found the end of available memory, and this address plus 1 is loaded into RAMTOP.

The effect of the NEW code is simply this: load BC with RAMTOP, decrement BC, and fall through to the initialization routine.

GOTO

As mentioned earlier, the only steps that the GOTO command handler must execute to accomplish its purpose are: 1) get the destination line number, 2) find the address of the specified line, and 3) load this value into NXTLIN. Let us examine each of these individually.

First, there is the matter of obtaining the line number specified as the argument to the GOTO. Reviewing Perceptions in the last issue of *SYNC* (which you, of course, have on the desk in front of you), find the entry for GOTO in the Offset Table *SYNC* 2:4, Listing 2). You will see that the first type specified was a CLASS-6 Entry and that CLASS-6 specifies an Integral-Expression.

As the parser examines the line in which the GOTO occurred, it called CLASS-6 to parse out the expression. CLASS-6 left the value of this expression on the calculator stack. A subroutine FIND-INT (at 0EA7 in the new ROM) will remove a value from the top of the calculator stack and round it down to 16-bit integer in the BC register pair. If the number is outside of the 0.65535 range, then the FIND-INT routine gives Report-B.

Now we have the required argument for the GOTO statement. Next we must, using this number, find the address of the Basic line that it specifies. This type of search routine is about as common as a parser, and the designers of the Sinclair ROM, fearing that they might fall short of expectations, decided to incorporate just such a routine into the 8K ROM. The routine, located at 09D8h, takes a line number in the HL register pair, and returns the line number in BC, and the address of the requested line (or that of the next one, if no such line exists) in HL.

Since the first two stages of the GOTO have been accomplished, the last stage would appear to be easy. Indeed it is. All we need do now is to take the address returned by the search routine in the HL register pair, and place it in NXTLIN. The GOTO command handler then returns, and the Run-Executive continues at the new line without even the slightest sound of discontent.

CONT

If you look at the code for the Run-Executive very closely, you will see that, when an error is encountered, the current line number is loaded into a system variable called OLDPPC. This is the line number to which CONT continues. There is only one detail. If we go back to the same line at which the error occurred, and the cause of the error was only a STOP statement, then as soon as we CONTinue, we will re-execute the STOP. The code in the Run-Executive is smart enough to detect this situation. Whenever an error is going to be reported, the error number is compared with 09 (STOP). If the error number is 09, then the current line number is incremented before it is saved in OLDPPC.

With that little detail out of the way, I can now tell you how CONT works: it loads HL with OLDPPC and jumps to step 2 of GOTO. Simplicity.

REM

Once again we find that the advantages of having a well-written parser at our disposal are incredible. The command handler for REM is simply a RETurn instruction. If you consider this for a moment, you will see the ease with which it works in this system. When the RET is executed, the Run-Executive simply continues by adding the length of the line with the REM in it to the address of said line. The Run-Exec then continues normally at the NXTLIN.

We hope that this discussion of a few of the concrete command handlers will help you to understand better the way a computer, your computer, operates.

Until next time, same relativistic time period, same non-Euclidian universe. ■

Hardware Breakthrough!

* **ZX-Man**
  $14.95

* **Joystick**
  $14.95

* **Keyboard**
  $74.95
  full-size assembled w/leatherette case

FULLY ASSEMBLED KEYBOARD

1) Fully assembled
2) Includes Key Cap Legends
3) 30 Day Warranty
4) 2X80/ZX81 compatible
5) Some soldering necessary

THE INNOVATORS ARE COMING

Call or Write for more information

American Express, Visa, Master Charge, Money order, pc (allow 2-3 weeks to clear)
Please add $2.50 postage & handling
Illinois residents please add 5% Ill. sales tax

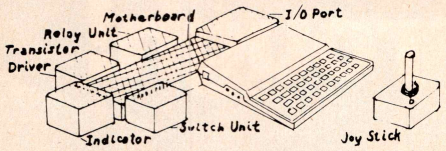
Visit our Showroom 10:00 - 6:00 Monday thru Saturday

AMERICAN EXPRESS Cards Welcome

VISA

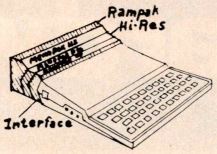
MICROCOMPUTERS PLUS, INC.
349 EAST MAIN ST.
GALESBURG, IL 61401
PHONE: (309) 342-9572

master charge THE INTERBANK CARD



Sinclair Place

P.O. Box 2288
Redmond, WA 98052



THURNAL ELECTRONICS *Very nice units.*

Modular system. All units are cased and plug together. No wiring, soldering or modifications. Can be used with RAM packs, printers, etc.

16 LINE INPUT / OUTPUT PORT 4¼"Wx3½"Lx1½"H
Fits between computer and RAM pack (if used). Does not require motherboard. 16 programmable I/O lines, divided into two 8 line ports. Fully handshaking, TTL compatible, very low power consumption. More than one can be used...**$34.00**

MOTHERBOARD 3¼"Wx6¼"Lx⅞" H
Plugs on the I/O port. Used for multiple add-ons. Up to 16 lines, i.e., 4 relay boxes, or 4 joysticks or 2 switch units and 2 relay units, etc.....**$30.00**

JOYSTICK
Plugs on I/O port or motherboard. Instructions, programming and free game listing provided.....**$25.50**

4 CHANNEL RELAY BOX* 3⅛"Wx2⅜"Lx1½"H
Allows programmable switching of loads to 3A., 110VAC/24VDC. Plugs into I/O or motherboard.....**$27.00**

TRANSISTOR DRIVERS* 3⅛"Wx2⅜"Lx1½"H
Contains 8 driver transistors (BC184L) and plugs on I/O or motherboard. Each transistor can pass 300 mA and stand 30V. Power dissipation is 300mW.....**$18.00**

8 WAY SWITCH UNIT 3⅛"Wx2⅜"Lx1½"H
Plugs onto I/O or motherboard. Enables user to set up binary numbers on the 8 lines of a port.....**$24.00**

8 WAY INDICATOR UNIT* 3⅛"Wx2⅜"Lx1½"H
Plugs onto I/O or motherboard. 8 LED's display output state of a port.....**$24.00**

Indicates this unit requires an external 9V power source.

QUICKSILVA *Uncased units, plug together, work well.*

MOTHERBOARD AND CONNECTOR
Fits between computer and RAM.....**$38.00**

SOUND GENERATOR BOARD.....**$51.00**

HI-RES GRAPHICS CONTROLLER
256H by 192V.....**$159.95**

CHARACTER GENERATOR
Up to 128 characters on 8x8 square.....**$49.50**

HAVEN HARDWARE *Uncased units*

Recommended for only experienced hardware users. Units are external with cables to be soldered.

INVERSE KEY MODULE.....**$12.00**

FULL SIZE KEYBOARD & REPEAT 3⅞"x9⅞"x1¼"
2 post key symbols, nice.....**$55.00**

REPEAT KEY MODULE
For editing - variable speed.....**$10.00**

PROGRAMMABLE CHARACTER GENERATOR.....**$59.50**

23 WAY EDGE CONNECTOR - gold plated.....**$6.00**

PARALLEL INPUT/OUTPUT PORT -
Plugs in before RAM.....**$25.00**

BOOKS

The Explorers Guide to the ZX81.....**$9.95**
Takes up where the manual ends.

The Complete ZX81 Basic Course...**$34.95**
Course programs on cassette....**$10.00**

Not Only 30 Programs ZX81:1K.....**$14.95**

Machine Language Made Simple.....**$19.50**

Understanding Your ZX81 ROM.....**$19.50**

ZX ROM Disassembly - Part A.....**$14.95**
- Part B.....**$14.95**

10% discount on books when you buy two or more books.

MEMOTEK *Modular system. Very nice.*

We recommend the 16K RAM expansion for the average user. There are presently few uses for larger memory. More memory can be added later if needed.

SPECIAL: MEMOPAK 16K RAM.....**$55.00** (list $59.95)

32K RAM.....**$99.95** 64K RAM.....**$179.95**

NEW: Memopak Hi-Res Graphics.....**$149.95**
and Centronics Parallel Interface.....**$99.95**
These units plug in between the ZX81 or TMS 1000 and the RAM expansion. All Memopak units are cased, plug in peripherals.

AUDIOGRAPH "CHIRPER"

Solders into circuit board to produce buzz whenever key is hit or a program operates. Easy to install.....**$9.95**

VOTEM Uncased — Size 4"Wx3"Lx1"H
Analog interface contains all hardware and software necessary to enable ZX81 or TMS1000 to measure voltages or temperature. Temperature probe included. Resolution better than 14 bits. Runs from computer power supply....**$59.95**

WILLIAM STEWART SYSTEMS

BIG EARS *Speech recognition system.* Cased—Size 6"x5"x2"
Words are stored as voice patterns which the system learns from repetition. Connects to an input port. Can store about 200 words which can be nested to form more words. Each word takes 150 bytes.....**$99.00**

TOUCH-A-MATIC Keyboard overlay

With fingertip cutouts.....**$9.95**

SOFTWARE

J. P. GIBBONS PERSONAL BANKING SYSTEM - 16K
Excellent program.....**$19.95**

AUTOFILE - 16K *Electronic filing system.*
Menu based. Auto search.....**$9.95**

ACCOUNTS - 16K
For keeping records of financial transactions.....**$9.95**

ENHANCED BASIC - 16K
Stored above RAMTOP. Auto renumbering, block delete. **$9.95**

WORD FIX - 16K
Mini word processor. Format, store, mix, transfer.....**$9.95**

COMPOSER - 16K
Write and play music without soundboard.....**$9.95**

GRAFIX - 16K - Draw and store complex images. **$9.95**

VU-CALC - 16K Spreadsheet.....**$24.95**
MULTIFILE PLUS - 64K.....**$34.95**
MULTIFILE - 16K.....**$29.95**
ZXAS - 16K Assembler - excellent.....**$9.95**
ZXDB - 16K Disassembler/-
Debugger.....**$9.95**
VIEWTEXT - both text & graphics.....**$14.95**

EDUCATION—MATH

ADD & SUBTRACT 1—
Grades 1, 2, 3.....**$39.95**
ADD & SUBTRACT 2—
Grades 3, 4, 5.....**$39.95**
ADD & SUBTRACT—
Grades 6, 7, 8.....**$39.95**
MULTI. & DIVISION 1—
Grades 3, 4, 5.....**$39.95**
MULTI. & DIVISION—
Grades 6, 7, 8.....**$39.95**

PUCKMAN - 16K
Machine code version.....**$9.95**
ADVENTURE B.....**$19.50**
ADVENTURE C.....**$19.50**
ZX CHESS II - 16K 6 levels.....**$24.50**
BACKGAMMON - 16K.....**$14.95**
FLIGHT SIMULATION - 16K.....**$24.95**

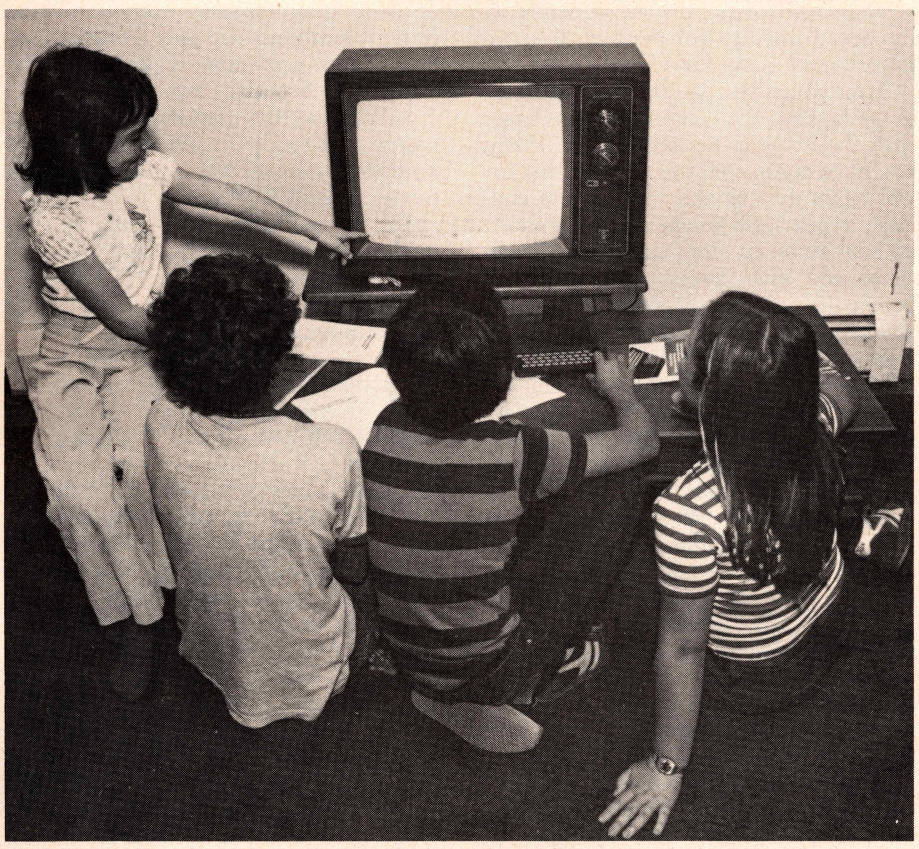
INVADERS - 16K.....**$9.95**
GAMES PAK - 1K.....**$9.95**
TOWERS OF HANOI - 16K
Classic game.....**$9.95**
SUPER INVASION - 1K.....**$14.95**
MAZOGS - 16K.....**$9.95**
RED ALERT - 16K.....**$9.95**
ALIEN INVASION - 16K.....**$9.95**
METEORITES - 16K.....**$9.95**

10% off software when you buy 3 or more programs.

FREE SHIPPING ON ORDERS OVER $25.00. ADD $1.50 FOR ORDERS UNDER $25.00. Washington residents add 6.5% sales tax.

List Learning with the Sinclair

James John Hollandsworth



Introduction

The Sinclair computers can be effective learning aids if the student or teacher has the software to set up learning situations. A program to assist in the learning process should meet several criteria. First, it should be self-explanatory. Second, it should have different modes of operation. Third, it should be practical as a learning tool. Fourth, it should be usable for various kinds of content. Fifth, it should be enjoyable to use. The List Learning Program discussed in this article meets these critera. Let's look at this program and how you can use it to increase your learning or to help others over some of the hurdles of list learning.

John James Hollandsworth, Box 163, Montcoal, WV 25135.

Entering the Program

Type in the entire program in Listing 1. I would strongly urge saving your work frequently. Spending three hours at your Sinclair and having a power interrupt can be frustrating. After you have typed in and saved the entire program, congratulate yourself for your endurance!

Next, decide on the content for the list you want to use with the program. This list must consist of two columns in which the items to be memorized are paired. I originally designed the program for the list of the 92 natural elements and their symbols (this list can be found in any encyclopedia, usually under "The Periodic Law" or in any chemistry textbook). This is, of course, very valuable for anyone taking chemistry, but many other lists are possible, e.g., a list of states and abbreviations or capitals or other information.

Loading the Lists

When you have your two-column list prepared, enter it by following the steps listed below. For the sake of illustration, I will use the list of the 92 elements, so you will have to make the appropriate changes for your own list.

If you put your computer in FAST mode for entering the program, be sure to return to SLOW mode for entering your lists in order to avoid the screen flicker when the program starts running by itself later.

1) To get into the utility list loaded program, type GOTO 1000. NEVER, NEVER, NEVER, TYPE RUN in this program or you will lose your list.

2) A menu of the utility program's functions will appear. Since you wish to load a new list, type in 1.

3) Input the title of your program which will appear when the program begins, e.g., "LEARNING THE ELEMENTS SYMBOLS."

4) Type in the title of the first class of items in your list. This should be the class with the longest strings if applicable. In the list of elements the names of the elements are obviously longer than the symbols so you would type in "ELEMENT–". If your list has two classes of items that are about the same (such as states and their capitals), it does not matter which is first.

5) The program now needs to know how many characters are in the longest word in the first class list. In the elements list this is 12.

6) Enter the name of the second class ("SYMBOL–") and the length of the longest items (2).

7) Enter the number of items in your list (92 elements).

8) Now a display of everything you have typed in appears. If you have made a mistake, type N to start over.

9) To start entering the actual list, type Y. At the bottom of the screen a prompt will appear, e.g., "ELEMENT–". Type in the first element "HYDROGEN," and it will be displayed beside the prompt which will then scroll up to make room for the "SYMBOL–" prompt. Type in "H", and the element prompt will reappear. Continue typing in the items until you have finished your list. If you see a mistake in something you have typed in, just finish the list.

10) After you finish typing in everything, the program will go into a review. The first pair of items will be displayed (ELEMENT-SYMBOL). If the pair is correct, hit ENTER to review the next pair. If either is incorrect, hit the X key and ENTER. The prompt for your first item will appear (ELEMENT–); type the entry in correctly. The prompt for the second item will appear (SYMBOL–); type in this entry correctly. The program then moves on to the next pair until all have been reviewed.

11) The program asks for the name that the program will be SAVEd under.

12) At this point you will return to the menu. If you want to review the list again to make changes or to doublecheck, type in 2. If you want to change the SAVE name, type in 3. If for some reason you want to start over, type in 1. To SAVE the program, hook up your recorder and position your tape where you wish to start. Hit 4 and ENTER and immediately hit the RECORD button. (If you used the elements list, the program will take 3:15 minutes to SAVE.)

13) After you have SAVEd the program, the utility program will put you into the actual learning program. Whenever you need to use the utility program again, simply type BREAK during a PAUSE and type GOTO 1000.

Now you can enjoy the fruits of your labor, but you must read the next section.

Using the Learning Program

When you LOAD the program or get out of the utility program by SAVEing, the list learning part of the program automatically starts. This prevents someone from being in a position to RUN it by accident.

The title of the list appears at the top of the screen, and a request to type in your name appears below it. This allows the computer to address you personally. Though this routine may be considered a frill, users may enjoy the feeling of a more personal interaction with the computer in a learning situation.

Program Modes

After typing in your name, you will see a program mode menu appear on the screen. This menu gives you four modes for using the lists you have entered.

Mode 1: Reviewing the List

The first mode is akin to running your finger down a list as you try to memorize it. However, when the computer does the moving, the situation is more involving and generally more effective. The program goes through the list in this manner: It flashes an item from the first list, pauses to allow the user time to remember the corresponding item from the second list, and then displays the second item. This procedure is more stimulating and helpful as a learning technique than simply displaying the pair of items simultaneously.

The speed of the display depends on the speed number you type in: 0 is the fastest and 9 is the slowest.

After you have gone through the items in the first list, the computer begins again with the items in the second list. When you have completed this list, the first list will again appear and the process endlessly repeats. So whenever you want to go back to menu, press the Q key. Sometimes you must press twice or thrice before the program responds. Entering Q will also exit you from modes 2 and 3.

Mode 2: Practice Drill

In the practice drill the program will randomly select 15 items from the first list and ask for the corresponding match. Then it will reverse the lists and again ask for the match. If your list has 40 items or more, the practice drill executes a special feature. Each time the drill is called up, an array E$ is used as a tally. If you answer a question correctly, the program "makes a note of it" and will not ask that item pair again. This tally is erased each time the practice drill mode is entered. Also, you will notice that, when you do not give a correct match, the program pauses longer after the correct answer is displayed. The additional time to look at the correct answer is a study feature. At the end of thirty questions, the number of correct answers is displayed.

Mode 3: Speed Quiz

In this mode you are given items from the longer list and asked for the matching item from the shorter list. You try to get as many of the pairs as possible in sixty seconds. This is the reason for making the second column shorter so that more questions can be answered in one minute. The computer gives you one point for each correct answer and penalizes you one point for each incorrect answer. If you have no idea what the answer is, hit ENTER. Inputting a null string in this way will move you on to the next question without penalty. After sixty seconds the program stops and displays your score.

Mode 4: Fond Farewell

The final mode is simply a "Fond Farewell" to the user. Instead of STOPping, the program will PAUSE about seventeen seconds and restart at the beginning. The purpose of this procedure is to prevent the user from accidentally RUNning it. This is also an ideal place to BREAK the program if you need to LIST it, modify it, or get into the utility program.

Program Features

This program provides you with a base for a custom program of your own. Not only can you use it for any two column list learning that you want, but also, with over 230 lines, you can tinker, change, and modify to your own satisfaction.

Subroutines are placed at the beginning of the program for faster execution. Most of the subroutines are only a line or two, but they do save memory. Let's note the following subroutines especially.

Subroutine 10 is used to pick a random number and set up the screen. If a random number is not needed (as in the review mode), it is GOSUB 12.

Subroutine 15 is used in the review mode to test whether the user wants to exit. In modes 2 and 3 it is GOSUB 16.

Subroutine 20 is used in the first three modes in the initial display.

Subroutines 25 and 30 are used in the drill mode. The 8K ROM has an internal timer at memory locations 16436 and 16437 which PAUSE uses. It decrements every time a frame on the TV is displayed, i.e., sixty times a second. To time the speed drill, I POKEd the values to 0. The timer then starts counting backwards, beginning at 65536 and losing 60 a second. After each input, the computer PEEKs the value to see if it has passed 61936 which is the 60 second value. Notice that PAUSE cannot be used during this time because it also POKEs the value.

Routines such as in lines 657-659 are found in modes 2 and 3. These routines are needed to add spaces to a user input because the input has to be the same length as the answer in the array for the two to be compared.

The Variables

To facilitate user changes, the list of variables used in the program is as follows:

T$: The title of the program.

C$: The name of the user entered at the beginning.

M$: The name of the first class of items.

N$: The name of the second class of items.

L1: The length of the longest item in the first list.

L2: The length of the longest item in the second list.

TS1000-ZX81 OWNERS

KRAKIT™

WIN $20,000 or more

KRAKIT™ is an adventure and a treasure hunt for the ZX81 and TS1000 computers. The bank account and prize money actually exist. Be the first to crack the puzzle and the prize is yours. Only one prize will be awarded.

SOLVE 12 CLUES LIKE THIS!

Where it all began. Where the torch was first lit. Where muscles and sinews strain. Where our heros win acclaim. Where the symbols hold the key.

KRAKIT™ consists of 12 clues on a ready-to-run ZX81 or TS1000 cassette tape (16k RAM). The answer to each clue is the name of a country, a city or town, and a number. If you are the first qualified entrant to solve all 12 clues and declared the winner, you receive two tickets to the city of the secret KRAKIT™ vault location. When you arrive at that location, a check for a minimum amount of $20,000.00 (U.S.) will be presented to you. The amount of the prize money is augmented weekly.

TS1000-ZX81

RULES

1. The first qualified entrant to be confirmed by the judges to have completed all the clues correctly is the winner.

2. There will be one winner only.

3. No persons connected to International Publishing & Software Inc. or their families are eligible to enter KRAKIT™

4. This offer is not valid where prohibited by law.

5. Due to the confidential nature of KRAKIT™ we regret we are unable to enter into any individual correspondence. All the required information, including how to claim the prize, is on the computer tape.

6. The winner will be required to sign an affidavit of compliance with these rules.

INTERNATIONAL PUBLISHING & SOFTWARE INC.
P.O. BOX 1654, BUFFALO, N.Y. 14216

Mail to:
INTERNATIONAL PUBLISHING & SOFTWARE INC.
P.O. BOX 1654, BUFFALO, N.Y. 14216

Please send _____ copies of KRAKIT™ at $19.95 plus $1.50 shipping.

Total _____ enclosed is ☐ check ☐ money order

Charge to ☐ Visa ☐ Mastercard

Number _____

Expiry _____ Signature _____

Please print:

Name _____

Address _____

City _____ State _____

Zip _____

Allow 2 weeks for personal checks.

Dealer inquiries welcome.

other FINE PRODUCTS from INTERNATIONAL PUBLISHING

3952 Chesswood Drive
Downsview, Ontario, Canada M3J 2W6

• GAMES • GAMES • GAMES •

MARINE RESCUE: fast action underwater
TANK TRAP: destroy enemy planes & land mines
GALAXY INVADERS: repel fleets of invaders
INVADERS: the classic computer game
ZX SCRAMBLE: a fast-moving space game
CROWN & SCEPTER: a medieval adventure
GALACTIC COMMANDO: a space war adventure
TRACK DOWN: an adventure in the old west
BLACKJACK: as played in Vegas
SLOTS: beat the one-armed bandits
ZX CHESS I: 6 levels: black or white: save games
ZX CHESS II: chess master: 7 levels: champion rated
1K CHESS: 1 level: no castling or en-passant
PLANET OF FEAR: find your stolen spaceship
INCA CURSE: get gold out of the temple
SHIP OF DEATH: free your ship from an alien cruiser
NANTIR RAIDERS: arcade game: 4 waves of attackers
GOBBLE MAN: famous arcade game: chase ghosts in a maze
1K GAMES: 11 games for unexpanded ZX81/TS1000
SHOOT OUT: how fast are you "on the draw"

FAMILY EDUCATION & HEALTH & ENTERTAINMENT

WEIGHT CONTROL: a personalized weight loss program*
CONSTELLATION: your computer is your telescope*
SOLAR SYSTEM FILE: a databank on the solar system*
BIORHYTHMS: plot your physical, emotional, intellectual cycles*
BOOK OF DAYS: facts, trivia, birthdays in a datafile*
PERSONAL RECORDS STORAGE SYSTEM: create a personal datafile*
FLASHCARD: memory aid, learning aid, testing device
MOVIE HANGMAN: guess the movie; beat the Hangman

PROGRAMMING AIDS

Z-AID 1.0: a machine code programming aid
ZX BUG: for debugging, editing & running machine codes
ZX ASSEMBLER: powerful tool for machine code programs
TOOLKIT: add 9 commands to basic; including renumber
ZX FORTH: ease of basic with machine code speed*

** comes complete with a detailed guide*

DEALER ENQUIRIES INVITED.

A: The user menu input; also used in FOR-NEXT loops.

Z: The review speed.

TOT: The total number of items in the list.

U: Score for the drill and speed quizzes.

F1: Flag used in the utility program.

F2: Flag-1 if the list is fewer than 40 items.

D$: Generally used for user inputs.

L$: SAVE name.

P: 16437; used in POKE after PAUSE statements.

Q: 255; used in POKE after PAUSE statements.

A$(?,?): Array used for first list items; dimensioned as A$(TOT,L1).

B$(?,?): Array used for second list items; dimensioned as B$(TOT,L2).

E$(?): Array used to keep track of correctly answered items in drill mode; dimensioned as E$(TOT).

Final Observations

If you SAVE the program first without any list entered, it is ready for use with any list. Of course, after you have entered a list, the program and your list should be SAVEd together. You can have as many custom programs as you need. Changes in the program may broaden its use in your particular situation. *SYNC* would be interested in hearing from readers concerning their use of this program. ■

```
   1 REM LIST LEARNING BASE PROG
RAM BY JAMES JOHN HOLLANDSWORTH,
 BOX 163, MONTCOAL, WV 25135--PH
ONE 304-854-2237
   3 REM REVISED 8-4-82
   4 REM  TO RUN PROGRAM TYPE
GOTO 100
   5 REM TO MANIPULATE LIST TYPE
 GOTO 1000
  10 LET B=INT (RND*TOT)+1
  12 CLS
  13 PRINT "--------HIT 0 FOR ME
NU---------"
  14 RETURN
  15 LET D$=INKEY$
  16 IF D$="0" THEN GOTO 990
  17 RETURN
  20 PRINT "IN THIS MODE, ";C$;"
."
  21 RETURN
  25 PRINT "YOU SAID IT WAS ";D$
"."
  26 RETURN
  30 PRINT TAB 8;"YOU ARE CORREC
T."
  31 RETURN
 100 PRINT T$
 104 PRINT AT 5,0;"PLEASE TYPE I
N YOUR NAME."
 110 INPUT C$
 115 CLS
 120 PRINT "HELLO, ";C$;"."
 125 PRINT "I WILL HELP YOU LEAR
N SOME ";M$;"S AND THEIR ";N$;"S
.  THE MENU OF THINGS I CAN DO I
S:"
 126 PRINT
 130 PRINT "1. REVIEWING THE LIS
T"
 131 PRINT "2. PRACTICE DRILL"
 132 PRINT "3. SPEED QUIZ"
 133 PRINT "4. EXIT THE PROGRAM"
 134 PRINT
 135 PRINT "PLEASE TYPE IN THE N
UMBER OF     YOUR CHOICE, ";C$;".
"
 140 INPUT A
 142 IF A<>1 AND A<>2 AND A<>3 A
ND A<>4 THEN GOTO 140
 145 CLS
 150 GOTO A*200
 200 PRINT "REVIEWING THE LIST--
"
 205 GOSUB 20
 210 PRINT "I WILL DISPLAY A ";N
$;" ON THE SCREEN, PAUSE, THEN D
ISPLAY THE ";M$;".  AFTER REVIEW
ING ALL ";TOT;" I WILL SWITCH TO
 SHOWING THE ";M$;" FIRST.  TYPE
 A NUMBER FROM 0 TO 9--0 BEING A
 VERY FAST REVIEW AND 9 THE SLOW
EST."
 215 INPUT Z
 217 IF Z<0 OR Z>9 THEN GOTO 215
 220 FOR A=1 TO TOT
 225 GOSUB 12
 230 PRINT AT 10,8;B$(A);" ";
 235 PAUSE 20+Z*10
 236 POKE P,0
 240 GOSUB 15
 245 PRINT A$(A)
 250 PAUSE 20+Z*10
 251 POKE P,0
 255 GOSUB 15
 260 NEXT A
 265 FOR A=1 TO TOT
 270 GOSUB 12
 275 PRINT AT 10,8;A$(A);" ";
 280 PAUSE 20+Z*10
 281 POKE P,0
 285 GOSUB 15
 290 PRINT B$(A)
 295 PAUSE 20+Z*10
 296 POKE P,0
 300 GOSUB 15
 305 NEXT A
 310 GOTO 220
 400 PRINT "PRACTICE DRILL---"
 405 GOSUB 20
 410 PRINT "I WILL GIVE YOU 15 "
;M$;"S IN SUCCESION.  YOU TYPE I
N THEIR ";N$;"S.  THEN I WILL GI
VE 15 ";N$;"S AND YOU TYPE IN TH
E ";M$;"S.  PRESS ENTER TO START
."
 412 LET U=0
 415 INPUT Z$
 419 IF F2 THEN GOTO 435
 420 FOR A=1 TO TOT
 425 LET E$(A)=CHR$ 0
 430 NEXT A
 435 FOR A=1 TO 15
 440 GOSUB 10
 445 IF E$(B)="X" THEN GOTO 440
 447 PRINT AT 9,0;"TYPE IN THE "
N$;" FOR--"
 450 PRINT AT 10,8;A$(B)
 460 INPUT D$
 462 GOSUB 25
 465 GOSUB 16
 470 IF LEN D$=L2 THEN GOTO 475
 472 LET D$=D$+" "
 473 GOTO 470
 475 IF D$=B$(B) THEN GOTO 490
 477 PRINT TAB 8;"NO, IT IS ";B$
(B);"."
 478 PAUSE 200
 479 POKE P,0
 480 GOTO 497
 490 IF NOT F2 THEN LET E$(B)="X
"
```


"ASTROLOGY"

FOR ZX-81/80/TIMEX (16K)

*** CAST HOROSCOPES COMPLETE WITH CHART**
*** LOCATE PLANETS**

ASTROLOGY COMPUTES THE POSITION OF THE PLANETS IN THE SKY FOR ANY TIME AND ALMOST ANY PLACE IN THE 20TH CENTURY. ALSO COMPUTED ARE SIDEREAL TIME AND JULIAN DAYS. THESE FEATURES MAKE "ASTROLOGY" USEFUL NOT ONLY FOR THE PURPOSE OF CASTING HOROSCOPES BUT ALSO TO ASTRONOMERS FOR LOCATING THE PLANETS. CAST HOROSCOPES FOR FRIENDS AND FAMILY AND PAY FOR "ASTROLOGY" MANY TIMES OVER!

DIGITAL POSI-LOAD TAPE WITH INSTRUCTIONS AND CHART $20.00

OPTIONAL—RECOMMENDED BOOK *THE ASTROLOGERS HANDBOOK* **(HARDBOUND) BY SAKOIAN & ACKER—PUB. HARPER & ROW $18.50**

HAM-AID

ZX81/80/TIMEX (2K)

*** THE ELECTRONIC CALCULATOR**

CALCULATE REACTANCE, RESONANCE, RESISTORS IN PARALLEL, AND EVALUATE EXPRESSIONS

POSI-LOAD TAPE WITH INSTRUCTIONS $8.00

Active Designs
1108 BILTMORE DR.
NASHVILLE, TN 37204
615-297-4755

WE SALE PLANS YOU SAVE MONEY

SYNCHRONIZE YOUR SINCLAIR

KEYBOARD how to add a full-size keyboard to a ZX80 or 81. Includes instructions on how to use extra keys for Shift Lock, Automatic Shift, Automatic Repeat and Reset. $5.00

POWER SUPPLY how to design and build supplies to fit your needs. Covers single and multi-voltage. $5.00

BUSS unlimit your edge connector with this inexpensive expansion. $3.50

JOYSTICK add popular Atari joystick and find out how much fun games can be. $2.50

PHONE MODEM talk to the world with your computer. $3.50

RS 232 the most universal serial interface Standard on many peripherals. $3.50

Send check or money order to:
USA funds only please.

SYNCHRONIZE
Box1667
Kerrville, Texas 78028

```
492 GOSUB 30
493 LET U=U+1
495 PAUSE 100
496 POKE P,0
497 NEXT A
500 FOR A=1 TO 15
505 GOSUB 10
510 IF E$(B)="X" THEN GOTO 605
512 PRINT AT 9,0;"TYPE IN THE "
;M$;" FOR--"
515 PRINT AT 10,8;B$(B)
520 INPUT D$
525 GOSUB 25
527 GOSUB 16
530 IF LEN D$=L1 THEN GOTO 545
535 LET D$=D$+" "
540 GOTO 530
545 IF D$=A$(B) THEN GOTO 560
550 PRINT TAB 8;"NO, IT IS ";A$
(B);"."
553 PAUSE 240
554 POKE P,0
555 GOTO 575
560 GOSUB 30
565 IF NOT F2 THEN LET E$(B)="X
"
570 PAUSE 120
571 POKE P,0
572 LET U=U+1
575 NEXT A
580 CLS
585 PRINT "YOU GOT ";U;", ";C$;
"."
586 PRINT "A VERY GOOD SCORE IN
DEED."
590 PRINT "HIT ENTER TO RETURN
TO MENU."
592 INPUT D$
595 GOTO 990
600 PRINT "SPEED QUIZ---"
605 GOSUB 20
610 PRINT "I WILL GIVE YOU ";M$
;"S-TYPE IN THE ";N$;"S. AFTER 6
0 SEC. I WILL DISPLAY YOUR SCORE
.  I WILL GIVE YOU 1 POINT FOR A
 CORRECT ANSWER TAKE 1 POINT FOR
 AN INCORRECT ANSWER AND NOT DO
ANYTHING IF YOU ONLY PRESS ENTER
.  PRESS ENTER TO START."
612 LET U=0
615 INPUT D$
620 POKE P-1,0
625 POKE P,0
630 GOSUB 10
640 PRINT AT 10,8;A$(B)
645 INPUT D$
647 IF PEEK (P-1)+256*PEEK (P)<
61936 THEN GOTO 580
650 IF D$="" THEN GOTO 630
655 GOSUB 16
657 IF LEN D$=L2 THEN GOTO 660
658 LET D$=D$+" "
659 GOTO 657
660 IF D$<>B$(B) THEN LET U=U-1
665 IF D$=B$(B) THEN LET U=U+1
670 GOTO 630
800 PRINT "YOUVE DONE VERY WELL
 ";C$;"."
805 PAUSE 120
806 POKE P,0
807 PRINT
810 PRINT "I HOPE YOU HAVE ENJO
YED YOURSELFAND LEARNED SOMETHIN
G."
812 PRINT
815 PAUSE 120
816 POKE P,0
820 PRINT "******* HAVE A NICE
DAY ********"
822 PAUSE 1000
823 POKE P,0
824 CLS
825 GOTO 100
990 CLS
995 GOTO 130
996 SAVE L$
997 GOTO 100
1000 PRINT "LIST LOADER PROGRAM"
1005 GOTO 1327
1008 LET F1=0
1009 PRINT "TYPE THE TITLE OF YO
UR LIST."
1010 INPUT T$
1011 LET P=16437
1012 LET F2=0
1013 LET Q=255
1015 CLS
1020 PRINT "TYPE THE TITLE(SINGU
LAR) OF THE 1ST CLASS OF ITEMS I
N YOUR LIST.  THE 1ST CLASS SHOU
LD CONSIST  OF THE LONGEST ITEMS
 IN LENGTH  IF POSSIBLE."
1030 INPUT N$
1035 CLS
1040 PRINT "HOW MANY CHARACTERS
ARE IN THE  LONGEST ITEM IN THE
1ST CLASS?"
1050 INPUT L1
1055 CLS
1060 PRINT "TYPE THE TITLE(SINGU
LAR) OF THE  2ND CLASS."
1070 INPUT N$
1075 PRINT "HOW MANY CHARACTERS
ARE IN THE  LONGEST ITEM IN THE
2ND CLASS?"
1080 INPUT L2
1085 CLS
1090 PRINT "HOW MANY ITEMS IN EA
CH CLASS OF THE LIST?"
1095 INPUT TOT
1100 CLS
1105 PRINT "TITLE-";T$
1110 PRINT "TITLE 1ST CLASS-";M$
1115 PRINT "LONGEST STRING 1ST C
LASS-";L1
1120 PRINT "TITLE 2ND CLASS-";N$
1125 PRINT "LONGEST STRING 2ND C
LASS-";L2
1130 PRINT "ITEMS IN LIST-";TOT
1135 PRINT
1140 PRINT "IS THIS INFORMATION
CORRECT-Y/N?"
1145 INPUT Z$
1150 IF Z$="N" THEN RUN 1000
1151 IF TOT<40 THEN LET F2=1
1160 DIM A$(TOT,L1)
1165 DIM B$(TOT,L2)
1170 DIM E$(TOT)
1175 CLS
1185 PRINT AT 10,0;"ENTER THE 1S
T ITEM IN THE 1ST  CLASS/THEN 1
ST ITEM IN 2ND CLASSTHEN 2ND ITE
M IN 1ST CLASS, ETC."
1190 FOR A=1 TO TOT
1200 IF NOT F1 THEN GOTO 1250
1205 SCROLL
1210 PRINT M$;"--";A$(A)
1215 SCROLL
1220 PRINT N$;"--";B$(A)
1225 INPUT Z$
1230 IF Z$="" THEN GOTO 1290
1250 SCROLL
1255 PRINT M$;"--";
1260 INPUT A$(A)
1265 PRINT A$(A)
1270 SCROLL
1275 PRINT N$;"--";
1280 INPUT B$(A)
1285 PRINT B$(A)
1290 NEXT A
1292 CLS
1295 IF F1 THEN GOTO 1320
1300 PRINT AT 10,0;" WE WILL NOW
 REVIEW EACH PAIR OFITEMS.  WHEN
 THEY COME ON THE  BOTTOM OF TH
E SCREEN, HIT ENTER  IF THEY ARE
CORRECT.  HIT X AND THEN ENTER I
F THEY WRONG. THEN  ENTER EACH O
F THEM AS YOU DID  BEFORE."
1305 LET F1=1
1310 GOTO 1190
1320 PRINT "TYPE IN THE NAME YOU
 WISH TO  SAVE THIS PROGRAM UN
DER."
1325 INPUT L$
1326 PRINT "SAVE NAME--";L$
1327 PRINT
1328 PRINT
1330 PRINT
1335 PRINT "1. LOAD NEW LIST "
1336 PRINT "2. REVIEW/REVISE LIS
T"
1337 PRINT "3. CHANGE SAVE NAME"
1338 PRINT "4. SAVE PROGRAM"
1339 PRINT
1340 PRINT "TYPE IN THE NUMBER O
F YOUR  CHOICE.  IF YOU INTE
ND TO SAVE  START RECORDER AS SO
ON AS YOU  PRESS ENTER."
1345 INPUT A
1346 CLS
1347 IF A=4 THEN GOTO 996
1348 IF A=1 THEN RUN 1007
1349 IF A=3 THEN GOTO 1320
1350 IF A=2 THEN GOTO 1300
1355 GOTO 1330
```


ZX81 CLEVA computer ware TS1000

CASSETTE 1 (16K) $9.95

SNAKEBITE **Eat the snake before it eats you. Variable speed. Create your own hazards.**

BATTLE **Demanding game of military strategy that can be played by 1 to 4 players.**

CASSETTE 2 (16K) $9.95

STARTREK **Use graphic photon torpedo attacks to kill off the highly mobile Klingons.**

FUNGALOIDS **Save civilization by bombing the ever-multiplying fungus. Beware - it fights back.**

CASSETTE 3 (16K) $9.95

STARSHIP TROJAN **Pit your wits against the dangers of outer-space and try to save your damaged space-craft.**

PRINCESS OF KRAAL **Face the monsters hiding in the underground complex to find the treasure and save the Princess.**

CASSETTE 4 (16K) $9.95

CRAZY-CARDS **Learning the rules does not seem to help. Totally addictive for cheats.**

CUBE **Use your computer to solve the mysteries of the Rubik Cube.**

1K and 2K Program Packs also available - Write for details

Check or Money Order payable to: **CLEVA Computer Ware,** ***92 Wyckoff Street, Brooklyn, New York 11201***

New York Residents only add Sales Tax. Add $1.50 for Shipping and Handling

Teaching with the ZX81

Eric Deeson

The Educational ZX80/1 Users' Group (EZUG) had a triple celebration in January. First, we were able to breathe a sigh of relief that we had survived a year of frenzied activity. Secondly, we welcomed the thousandth subscriber to our bimonthly newsletter. Thirdly, we launched our first educational ZX81 programs, fourteen of them in fact. Now, some months later our "membership" has passed 1500, and we have over forty validated and popular ZX81 programs on our list.

I make these points not because I want to plug the group, but to show that in Britain the year-old Sinclair micro is being taken seriously as a teaching resource. This will remain true, for a couple of years at least, despite the appearance of the remarkable Spectrum. While Spectrum and ZX81 programs are not interchangeable, they bear such a close relationship that rapid conversion is straightforward.

Our group's directory of suppliers to the ZX market currently lists organizations producing educational software for the machine. Also MUSE, Britain's leading educational computing organization, has given this record-breaking new machine a lot of support. Some support has come from Sinclair Research as well; in particular their educational software awards scheme attracted a great deal of interest.

Although actual data are very hard to come by, there is no doubt that already the ZX81 is by far the most popular micro in British schools. It compares very favorably with the longer-established front runners such as the Apple, the PET, and the Research Machines 380Z/480Z (a stolid, fairly old British microseries), and it is way ahead of the popular but newer BBC machine.

The number of ZX81s in use in British schools by now may exceed 10,000. This is as many as all other micros combined. Such success must be seen against the background of almost universal antagonism by the decision makers in our educational system. "The ZX81 is only a toy" is a common statement from inspectors and advisers; "Forget it," they say. A senior inspector with a large education authority even publicly stated the following: "If I come across a ZX81 in any of my schools, I'll stamp on it." British teachers tend to have a fairly low opinion of their advisers; such attitudes hardly help though I believe they are symptomatic of fear more than of anything else.

In a few areas, the authorities are now considering adopting the ZX81 as the official machine for the primary schools (Grades 1-6). But I know of none which provide much of the support that the teachers need such as courses, advice, software development, and so on.

Yet the ZX81 continues to infiltrate the schools at a breakneck pace, and the teachers are joining the Educational ZX80/1 Users' Group at a similar pace. The reasons for this are both external and internal. Schools and teachers are under pressure from pupils and parents to provide effective computing facilities and courses. That pressure is mainly linked to the ZX81 since it is by far the most popular micro in British homes.

Areas of Use

How are micros coming to be used in British education? The answer is not just applicable to the Sinclair range, of course, since to some extent at least the ZX81 can attempt anything other micros can do. And the answer is not just applicable to Britain because educational computing in North America is as progressive, successful, and exciting as on this side of the Ditch.

Furthermore, the answer is not just applicable to schools and colleges. The ZX81 is a help with the children's academic work at home, and many university departments have ZX81s around.

Classroom Uses

We can break the classroom uses down into the following categories.

Computer awareness. The primay aim is to increase familiarity with the computer and its uses. Most schools in Britain now attempt at least a few hours of this with all pupils.

Computer studies. The ZX81 is the apparatus used for formal computer instruction.

Computer-assisted learning. The computer joins the army of resources available for teaching in most subjects.

Other Uses in the School

Other school uses not directly in the classroom include:

Administration. The computer helps the daily routines of the school as it does in any other business.

Interfacing. Again the computer helps as in many other fields with data capture and process control.

Computer clubs. Many schools have thriving clubs in out-of-class time.

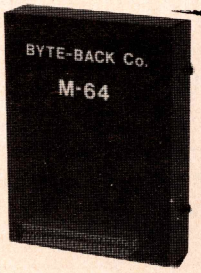
Fund raising. A major educational activity in Britain nowadays is the use of computer games for fund raising!

Developing software and hardware. Not a few schools find their facilities used by pupils (and teachers) for developing software and hardware products for sale.

Eric Deeson, Highgate School, Balsall Heath Road, Birmingham B12 9DS, U.K. Eric Deeson is the organizer of EZUG. For information about EZUG, send two international postal coupons (for air mail) to him at the above address.

BYTE-BACK modules

64-K MEMORY $119.95 KIT



WIRED and TESTED $129.95

IN STOCK!

SAME DAY SHIPMENT!

BYTE-BACK'S M-64 extends the memory of your ZX81 or Timex-Sinclair 1000 to a full 64-K. It's user transparent. It plugs directly into the back of the ZX81 and has an expansion port to allow you to still use a printer. No extra power supply is required. It has all standard features **plus** the area from 8-16-K can be switched out in **2-K** increments for memory mapped peripherals, PROMS, etc. Same proven reliability as our M-16 with thousands in use.

INSTANT INFORMATION WITH BYTE-BACK'S MD-1

IN STOCK

MODEM *only* $119.95 KIT

WIRED and TESTED $149.95

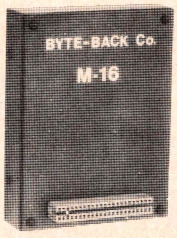
Use your phone to connect your "LITTLE" ZX81 to the "LARGEST" computer networks in the world. With **BYTE-BACK's MD-1 MODEM** connected all you do is dial a phone number (usually local), press a few keys and watch the data appear on your TV screen. (Software is included) This **MODEM** can be used in either the "originate" or "answer" mode with selectable baud rate.

You can have immediate access to:

UNIVERSITY COMPUTERS, DOW JONES, UPI, AND MORE !

As an extra bonus an RS-232 port is provided to allow you to drive all standard RS-232 peripherals. (75 to 9600 Baud)

EXPAND YOUR 16K SYSTEM



(M-16) $59.95 KIT

WIRED and TESTED $69.95

If you have a Sinclair 16K RAM module and need more memory, expand it to 32K and beyond by using **BYTE-BACK M-16 MEMORY MODULES.**

You can't connect two Sinclair 16K RAM modules together, but you can connect one Sinclair 16K and one or more **BYTE-BACK 16K** modules to get all the memory you need.

THOUSANDS IN USE WITH PROVEN RELIABILITY

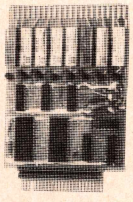
IN STOCK — SAME DAY SHIPMENT

BYTE-BACK'S BB-1 CONTROL MODULE

$59.00 KIT *In Stock!*

WIRED and TESTED $69.

- **8 Independent Relays** *(with LED status indicators)*
- **8 Independent TTL Inputs** *(with Schmitt trigger buffers)*



- By using a single POKE command you can change and latch the status of each of the 8 relays.
- Your **ZX80/1** can read the status of all 8 inputs by the use of a single PEEK command.
- A comprehensive manual is included that has complete application details.

RS-232 Module $59.95

IN STOCK/WIRED and TESTED $69.95

Allows you to connect ZX81 to all RS-232 printers & terminals.

ALL MODULES CARRY 90-DAY WARRANTY

TRY BYTE-BACK MODULES FOR 10 DAYS WITH NO OBLIGATION

Remember with:* BYTE-BACK *modules you are NOT limited to using only one module at a time!

BYTE-BACK CO.
RT. 3, BOX 147 • BRODIE RD.
LEESVILLE, S.C. 29070
Ph. (803) 532-5812

☐ M-64 Kit	$119.95	☐ M-16 Kit	$59.95
☐ M-64 Wired and Tested	$129.95	☐ M-16 Wired and Tested	$69.95
☐ M-64 Blank PC Board	$19.95	☐ M-16 Blank PC Board	$19.95
☐ BB-1 Kit and Manual	$59	☐ Modem Kit	$99.95
☐ BB-1 Wired and Tested and Manual	$69	☐ Modem Wired and Tested	$119.95
☐ BB-1 Blank PC Board and Manual	$29	☐ RS-232 Module Kit	$59.95
Shipping and Handling $4.95		☐ RS-232 Module Wired and Tested	$69.95

ORDER PHONE (803) 532-5812 **Bill My** ☐ Visa ☐ MasterCard

Exp. Date _____ Card No. _____

Name _____

Address _____

City/State/Zip _____

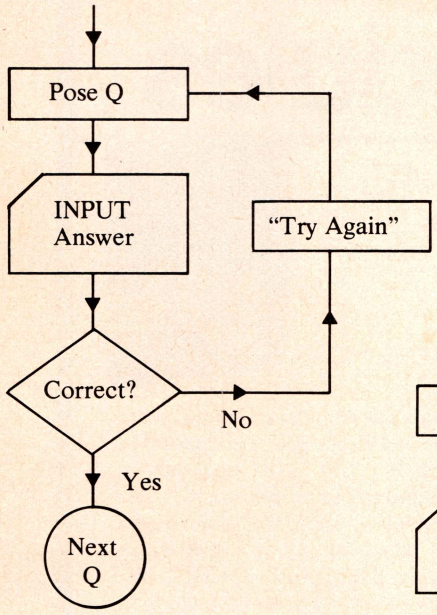
Mail To: **BYTE-BACK CO. • Rt. 3, Box 147 • Brodie Rd. • Leesville, S.C. 29070**

VISA

CHECKS

MasterCard

Figure 1. Flow Chart for Simple Q/A Routine.



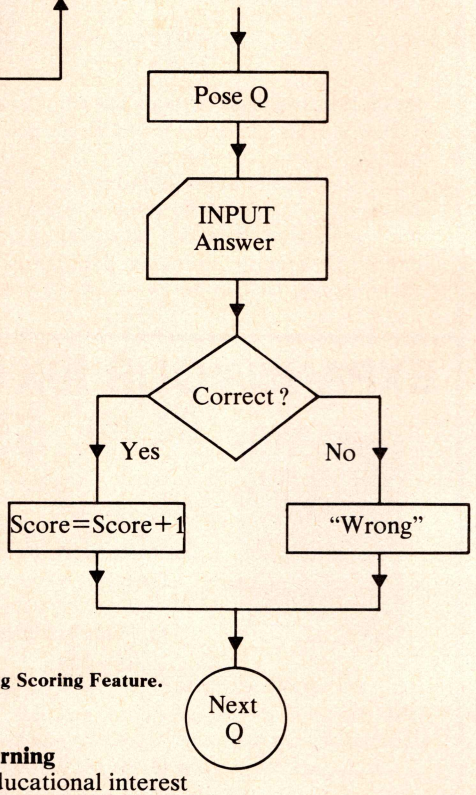


Figure 2. Flow Chart Adding Scoring Feature.

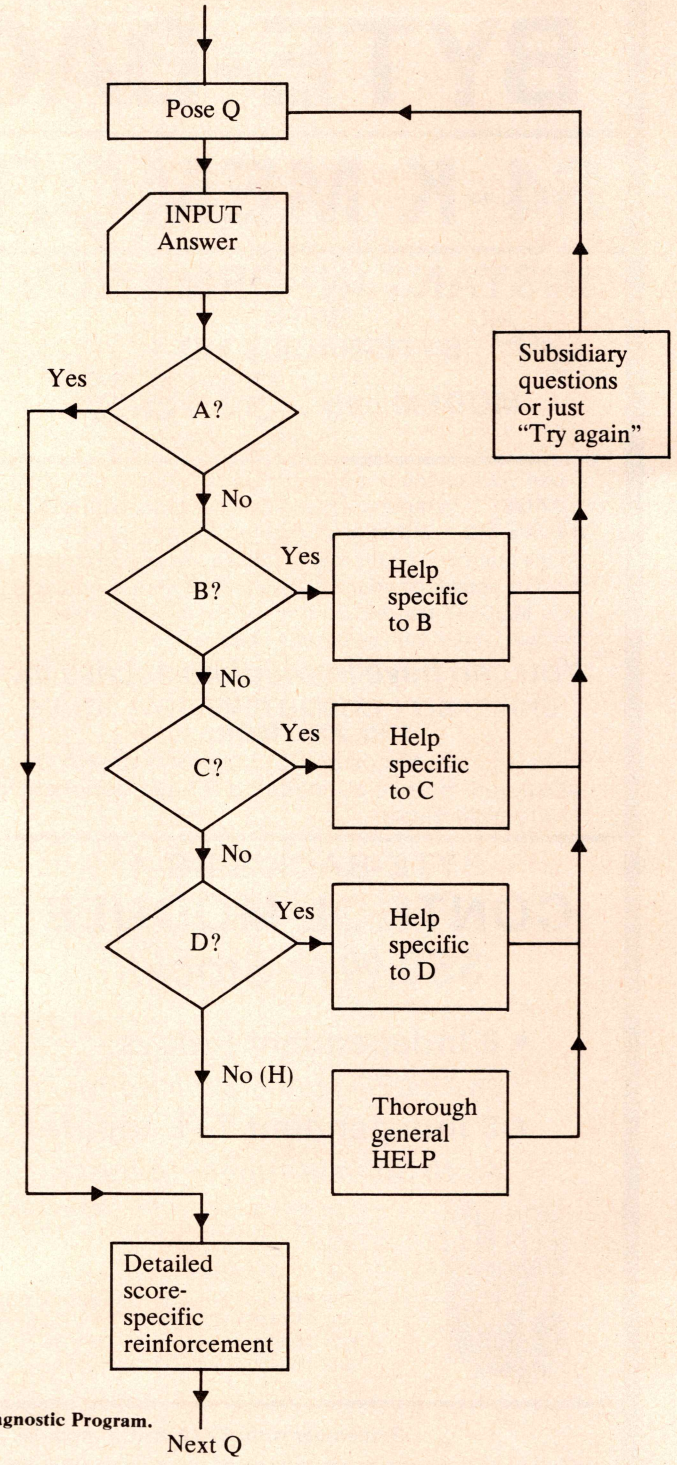


Figure 3. Flow Chart for Diagnostic Program.

Computer-Assisted Learning

Probably the main educational interest of most teachers and parents with a ZX81 is computer assisted learning (CAL).

McGraw-Hill's new *Devil's DP Dictionary* (which I hope you all get a chance to read!) has this to say:

CAI n. (Computer-Aided Instruction.) The misguided attempt to replace each teacher in the Bronx with 60 on-line terminals. CAL n. (Acronym for CALifornia or, archaic, Computer-Aided Learning.) A superior West Coast (USA) version of CAI in which each teacher is replaced by 25 on-line terminals.

Some people think that in the not too distant future teachers will be replaced by computers. I do not agree, even though micros are far more effective than terminals. Indeed I shudder at the picture of a school in which the children spend all their time connected to a computer, living like chickens in a battery farm. (Impossible future? No! A recent book describes how a computer could check continuously that the user's eyes are following the screen display!)

At the moment, however, we have hardly taken a couple of steps along the road to such computer systems. The ZX81, like other established micros, can run only fairly simple teaching programs. It will be a long time before the PLATO approach reaches school level!

Such programs are, on the whole, simple mechanizations of the teaching machine material of a couple of decades ago. In most cases they are very crude, with each frame (unit of teaching) being on the lines of those shown in a flowchart such as shown in Figure 1. To program this kind of thing is obviously fairly straightforward (at least, as long as the question requires a very simple "objective" answer). It can be elaborated by adding a scoring feature as shown in Figure 2.

Teaching is not like that though. Programs must therefore progress towards mirroring classroom technique in sophistication, flexibility, and explanation. Thus correct responses require that the user be further checked for understanding; each incorrect response should lead to relevant remedial assistance. The flow chart in Figure 1 rapidly becomes unmanageable and must be replaced with the type in Figure 3.

NEW! For the first time— *AVAILABLE IN THE USA!*

4 NEW Handbooks for your Sinclair ZX-81 or Timex-Sinclair 1000!!

MASTERING MACHINE CODE ON YOUR ZX-81

by Toni Baker

Until this comprehensive, yet easy-to-understand, handbook, there was virtually no material available about the ZX machine code. Using this guide you'll learn the ins and outs of ZX machine code translation. Discover the secrets of the ZX-81, and even see how to adapt the code to the ZX-80 machine. When you understand the language translations between BASIC and the ZX machine code, you'll enjoy the workings of your computer to the utmost!

49 EXPLODING GAMES FOR THE ZX-81

Edited by Time Hartnell

Galactic Intruders, Breakout, Checkers, Death Maze, Smugglers Mold, and forty-three other favorites are all here, newly adapted especially for you and your new ZX-81 personal computer. This fascinating gamebook gives you programming instructions for all 49 marvelous games PLUS complete and easy-to-understand game rules. This wonderfully exciting hardcover playbook can be yours, order below.

MAKING THE MOST OF YOUR ZX-81

by Tim Hartnell

All new for you and your new ZX-81, this handbook focuses on the additional features of the ZX-81. You'll have new games and useful learning tricks, and you'll also see how to write programs that really work. It will guide you through start to finish, using each feature and function of your new ZX-81 personal home computer.

THE ZX-81 POCKETBOOK

by Trevor Toms

This handy new programming manual really gets you into ZX-81 functions. Don't just type someone else's programs . . . now you can create your *own* and understand why they work. It's fun to learn all about computing with the ZX-81 POCKET BOOK as a guide. You'll see what your new ZX-81 can do, and what extras will make it able to do even more . . . see how to use ZX-81 BASIC in the best ways . . . learn to avoid frustration and retyping with program and data file storage and retrieval techniques—*and* for ZX-80 owners, you'll learn how to convert your ZX-80 to the advanced ZX-81 capabilities. And there's so much more! This road map to the ZX-81 can be yours—it's worth every penny!

Using these books you'll be amazed at how fast you'll become a ZX-81 wizard. Of course, if you don't find the books helpful and interesting return them within 15 days for a full refund, and owe nothing.

RESTON PUBLISHING COMPANY c/o
Mail to: PRENTICE-HALL INC., Book Distribution Center
Route 59 at Brook Hill Drive, West Nyack, New York 10995

Please send me my 15-day trial copies of the following titles:

____ **MASTERING MACHINE CODE ON YOUR ZX-81,** by Toni Baker, (R4262-3), $18.95
____ **49 EXPLOSIVE GAMES FOR THE ZX-81,** by Tim Hartnell, (R2087-6), $16.95
____ **MAKING THE MOST OF YOUR ZX-81,** by Tim Hartnell, (R4189-8), $16.95
____ **THE ZX-81 POCKET BOOK,** by Trevor Toms, (R9525-8), $16.95

Name_____
Address_____
City_____ State_____ Zip_____

VISA

Now you can charge your orders! Just fill in the information below:
VISA ☐ ☐ MASTERCHARGE

master charge

account #_____ expiration date_____
signature_____

Save! If check or money order, plus your state's sales tax, accompanies your order, publisher pays all postage and handling charges. Same money back guarantee applies.

Dept. V V-0881-Z8-(7)

Thus high expertise, both in programming and in teaching, is needed to produce material with even a little effectiveness. Like most micros, the standard 16K ZX81 despite its efficient use of memory cannot hold more than short programs of this nature. In Britain more and more teachers are turning to larger memories now available for the ZX81 in an attempt to overcome this problem.

Other aspects of teaching programs also require a great deal of attention still. Amazingly, it is common to find spelling and grammatical errors in material designed for use with children. This is inexcusable. Again, there is a skill in formatting the screen display that too few seem to appreciate.

So it is still early to expect the ZX81 to be actually used to teach more than a very few small topics in any course. There will be progress but we must wait a number of years to see much change.

The ZX81 As a Teaching Resource

Meanwhile, viewing the ZX81 as a teaching resource like worksheets and projectors does at least open up other fairly straightforward programming opportunities. Here are the approaches concerned.

1) Computations in geography, economics, maths, the sciences.

2) Development and testing of models in those subjects and for sports.

3) Retrieval of stored data in many subject areas.

4) Representations of data in graphical or tabular form (with or without hard copy).

5) Educational gaming and simulations in social, general, and science subjects.

6) Reinforcement (drill) and testing.

7) Control of laboratory and workshop equipment, and data capture.

Program Availability

In Britain now (early summer) perhaps a hundred adequate 16K ZX81 programs for learning are available. These sources are listed separately below. The vast majority of these are in the "reinforcement and testing" category, but at least a few are found in most of the others. For simple administrative tasks, too, some material has appeared. Of course, each one of those thousands of ZX81s in use in British schools will have available a fair number of unpublished and fairly short routines. Produced by both teachers and pupils, these are intended to meet restricted local objectives or to assist familiarization with the micro. There will be a huge overlap between these, but some will eventually surface in the form of distributed cassettes.

However, for the moment at least, educational software is slow-moving in Britain. Competition is becoming fierce as more companies appear. Yet most suppliers must be content with sales numbering tens a week rather than the hundreds or thousands experienced by the top games providers. The retail distributors are chary of handling educational material, too, as the criteria for its assessment are foreign to them.

EZUG

An Australian journalist described this not so long ago as sounding like a soap-powder. However, with some 1500 folk on roll (10 outside Britain) it must be the world's largest machine-specific educational user group. It is in fact a daughter of Britain's major educational computing association, MUSE, membership of which entitles one to obtain library programs. EZUG can, however, supply non-members in North America direct.

EZUG also publishes a bi-monthly Newsletter, a directory of suppliers to the ZX market (rather outdated now, so available for only £1.50 or $4.00), and special offers such as a 64K RAM built, fully tested, guaranteed for £53.50 or $109.50.

Details of EZUG can be obtained by air mail by sending two international reply coupons to me. To ensure rapid response it would also be wise to send coupons when approaching the other suppliers mentioned. All are struggling despite often excellent products. ■

BART TRUEHEART, WHERE ARE YOU?

In the Space Opera series games you are Bart Trueheart, the greatest genius hero of Earth. With your companions, the Kindly Old Professor (KOP) and his Beautiful Young Daughter (BYD) you travel the spaceways in your faithful ship, *The Rover of Space*.

But this idyll cannot last . . . you have enemies. The cunning Little Green Men (LGM's) of By-Orl and the brutish Big Eye Monsters (BEM's) of Milkorf have joined forces to form ***THE MALTRAXIAN ALLIANCE***.

Earth is depending on you to thwart their evil plans.

SO1: **THE MALTRAXIANS ATTACK**

You, as Bart Trueheart, must stop the fleet of the Maltraxian Alliance before it can concentrate and attack Earth. Time is limited and so are your resources. You have only your faithful ship, *The Rover of Space* and whatever you can capture from the enemy.

CAN YOU SAVE THE EARTH?

Ten levels of play.

$9.50 ($12.00 in Canada)

SO2: **RAID ON COLONY ALPHA**

BEM's have entered the life support dome of Earth's first interstellar colony. You, Captain Trueheart, must lead the few space marines stationed on Alpha. If the invaders are not repelled, Earth's colonization programme will end.

Fighting under the dome, you must clear the colony of invaders . . . but be careful, if the dome is pierced no one will survive.

$9.50 ($12.00 in Canada)

"ADVENTURE" STYLE GAMES:

SOA1: **DETENTION STATION INTRAG**

The professor's Beautiful Young Daughter has been captured by the Maltraxians and imprisoned in the dreaded *Detention Station Intrag*.

You must enter this orbital prison, find BYD and free her. Then, most difficult of all, you must escape with her from the alerted station.

This is no task for the fainthearted; only you, Bart Trueheart, could even consider such a dangerous rescue.

CAN EVEN BART TRUEHEART SUCCEED?

$13.95 ($16.95 in Canada)

SOA2: **ESCAPE FROM THE DARK SYSTEM**

You, Bart Trueheart, along with the Kindly Old Professor and his Beautiful Young Daughter have been marooned in a space-lifeboat in the fearsome **Dark System**.

Your only hope is to boldly land where no man has landed before . . . on Nekros, a LGM colony planet and to steal one of their starships.

You must evade surveillance satellites, police, security and military forces while finding a ship to take you home. There is little chance of success but what else can you do?

$13.95 ($16.95 in Canada)

All games are for ZX81 16KRAM

All games include instructions and designer's notes.

All orders from outside Canada include payment in American funds.

Add 10% for postage and handling.

Ontario residents add 7% P.S.T.

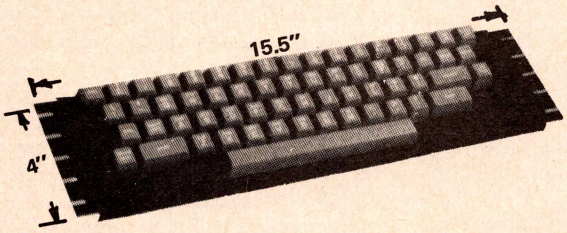
Send cheque or money order to:

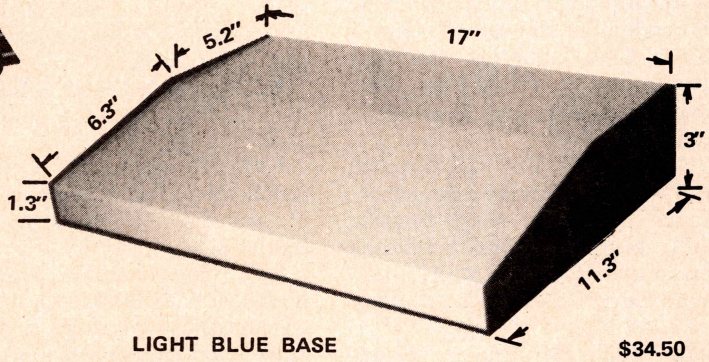
TURNER, ELCY & COM.,
1285 Dundas St., (Upr),
London, Ont., CANADA.
N5W 3B3

WANT TO BUILD A MEMORY? ADD AN I/O PORT? WE HAVE YOUR PARTS

We carry the parts you need to expand your computer; starting with a full line of Z80 support chips. If you need tools, we handle OK, WELLER, and XCELITE. We stock resistors, capacitors, switches, sockets, fans, descrete solid state devices, IC's, including TTL, CMOS, and linear, connectors,PAGE prototyping supplies, and HAMMOND and PAC-TEC cases to put it all in. If you see what you want give us a call, if you don't write for our free catalog.

KEYBOARDS and CASES





KEYBOARD has 62 keys, each with GOLD CONTACTS. Keys are mounted to a black metal plate. On all orders we include plans on how to convert the extra keys for Automatic Shift, Reset, and Automatic Repeat.

KEYBOARD KIT 34.95

WIRED and TESTED 49.95

LIGHT BLUE BASE

SAND COLORED PANEL

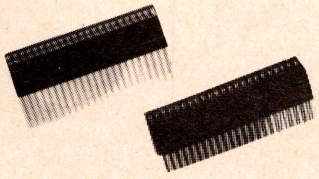
TEXTURED BAKED–ON FINISH

VENTILATED ON BOTTOM AND REAR

CASE AND PANEL ARE HEAVY (.081") ALUMINUM

SUPPLIED WITH HARDWARE AND RUBBER FEET $34.50

EDGE CONNECTORS

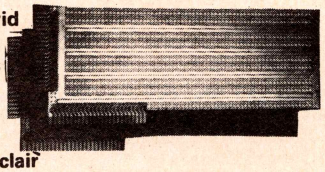


WIRE WRAP ECW-46
PCB MOUNT ECP-46
SOLDER TAIL ECS-46

Your Choice 4.95

PROTOTYPE BOARDS

Holes on '.100" grid to accommodate all DIP packages



50 pin connector
40 pin connector
same spacing as Sinclair

No etched circuitry except contact fingers allows maximum flexibility P500-1 15.95

Horizontal power and ground busses. Two holes on wiring side allow tack soldering of sockets to board. P500-3 22.95

SOLDERING IRONS

WELLER

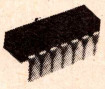
WP25	120V	25W	17.03
WP40	120V	40W	20.93

PENCIL THIN IRON (NOT SHOWN)
WM120 120V 12W 19.47

HOBBY WRAP TOOL

AUTO-INDEX
ANTI-OVERWRAP
MODIFIED WRAP
TOOL WITH BIT
BW2630B.....27.95

INTEGRATED CIRCUITS



C.P.U. & SUPPORT

Z80A CPU	9.45
Z80A PIO	7.65
Z80A CTC	7.65
Z80A DMA	19.95
Z80A SIO/2	21.95

MEMORY

6116–3	150ns	2Kx8	10.95
CMOS	Static	RAM	8/77.50
4116–4	250ns	16Kx1	2.15
	Dynamic	RAM	8/14.95
2516	450ns	2Kx8	6.95
+5volt	EPROM		8/48.55

JOYSTICK CONNECTORS

These connectors mate with Atari joysticks

PLASTIC SHELL
PCB MOUNT

Straight
DEP-9P 1.95

Right Angle
DEP-9PRA 2.25

METAL SHELL with SOLDER CUPS

DEM-9P 2.50
DEM-9S 2.95

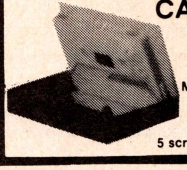
HOOD WITH STRAIN RELIEF 1.50

VACUUM VISE

VACUUM BASED
LIGHT DUTY VISE
1-1/2" WIDE JAWS
1-1/4" TRAVEL

VV1.....4.15

DATA CASSETTES



$1.75
10 for $15.00
Made for Datapoint by Maxell
90 min. with case
5 screw high strength shell

Check, money order, VISA, or Mastercharge. Add $3.00 for shipping and handling. Texas residents add 5% state sales tax. Foreign orders add $10.00 for shipping; U.S. funds only. Limited quanities on some items.

ALTEX ELECTRONICS

618 W. Sunset
San Antonio, Texas
78216

1–512–828–0503

Educational Software Suppliers

The following list gives some idea of educational software suppliers. In British terminology "primary" education is grades 1-5; "secondary" education is grades 6-12. "O Level" is a national examination for 10th graders.

Abies Informatics, 10 Barley Mow Passage, London W4. Expected to launch "Mickie," a CAL authoring program/language on cassette; derived from NPL's well-known medical diagnostic program. 16K + ; £15 (?).

AVC Software, PO Box 415, Birmingham B17 OHD. Primary/secondary/FE: physics, chemistry, math, English, geography, history, French (including Hangperson and Countdown series): £3 each. War Game (nuclear facts; interactive): £5. All 16K.

Calpac, 108 Hermitage Woods Crescent, St. Johns, Working, Surrey. OL chemistry programs; objective tests. 16K £4.95. Some good stuff here.

Computer Training Consultants, 4 Templar Way, Rothley, Leicester. Sophisticated software/manual/audio+video commentary packages planned in physics and computing (HE). As yet need much polish.

Customized Electronics, 155 Marton Rd., Middlesbrough, Cleveland. 1K junior maths. Not seen.

Edson Electronics, PO Box 151211, Tampa, FL 33684, USA. The only overseas ZX education specialist we have come across. Not seen.

Ed ZX, 16 Grasmere Rd., Dronfield, Woodhouse, Sheffield, 18. Excellent primary maths/English software; NUMPRAC (£3.45) was one of the first programs in the ZX MUSE Library and it is still one of the best.

EZUG, c/o Highgate School, Birmingham 12. Well, you know about EZUG by now.

KMC Programs, 97 Catharine St., Cambridge. Primary maths material from a "user-friendly concern of retired teachers."

LCL, 26 Avondale Ave., Staines, Middx. Has undertaken a major project transferring a package of Apple 10th grade maths programs (50 of them) to ZX. £5 for each cassette of four programs. Not seen yet.

Parsons, 23 Coxhill Gardens, River, Dover, Kent. Primary/secondary: art, geography, English, French. 16K; £4.95 per cassette of several programs.

Programs in Education, 49 Brittains Lane, Sevenoaks, Kent. Primary/secondary: geography, English, French. 16K.

Rose Cassettes, 148 Widney Lane, Solihull, West Midlands. The longest established company; primary/secondary maths, English, French. 16K. £4.50 per cassette of several programs.

Scisoft, 5 Minster Gardens, Newthorpe, Eastwood, Notts. Primary/secondary: maths/science; some with revision manuals. From £4.50. Good ideas, but general polish needed.

Simon Software, Freepost, New End, Redditch. 1/16K maths. £4 each. Not seen.

Sinclair Research, Freepost 7, Cambridge CB2 1YY. Have started (and about time, too) a new software push; including ICLs "teaching" programs. We still have not seen these; have you?

Spencer, S. The Sycamores, Queen's Road, Hodthorpe, Notts. The well-known Hodthorpe Collection; programs for teacher development plus manual.

Turner, 3 Hillgarth, Underbarrow, Kendal, Cumbria. Primary maths. 16K. £4.50 each.

Video Software, Stone Lane, Kinver, Stourbridge, West Midlands. Programs in finance, business, etc, mainly. Most are £5.95 and well documented. While their programs are not specifically for education, we recommend a number as being suitable.

William Ellis School, Highgate Rd., London NW5. Geography, physics, French; "O" Level. 16K. From £3.50. ■

FIZ - FLOPPY DISK INTERFACE FOR ZX81

The Hardware:
5"x5" P.C.Board plugs into most motherboard systems or, with our double con--nector , into the back of your ZX81. There is an on-board connector for your 16K RAM pack/printer, and a 34-way ribbon cable and connector for your 35 or 40 track Shugart SA400 compatible 5¼" disk drive. The board is powered by the ZX81 supply. The FIZ board has a 4K ROM and 2K workspace RAM, it occupies memory between 8K & 16K.

An 8K program loads from disk in approx. 11 seconds.

SEND FOR A LIST OF OUR ZX81 AND SPECTRUM SOFTWARE.

The Firmware:
Built-in routines to save and load programs as named files, to create random access files of specified length and write & read 128 byte records, to initialise new disks, to kill unwanted files and to display directory and length inform--ation. Routines can be used from keyboard or in programs, e.g. a nuber of 'load & run' programs may automatically run in sequence. Routines are actioned by name in USR calls LET E=USR WRITE,etc. E is an error code returned to BASIC. A simple command loads all the routine names from ROM. Apart from an overhead of 240 bytes the ZX81 is unaffected.

Price:
FIZ Board $149.95 / £79.95

Double Connector
$11.95 / £5.95

Please state for use with 35 or 40 track dive. We can supply a suitable drive, boxed with PSU, please write for details.

Post and packing is included in the price, allow 28 days delivery.

Send check, or Mastercard/Visa authorised in pounds sterling, to:

MACRONICS SYSTEMS LIMITED
26, SPIERS CLOSE, KNOWLE,
SOLIHULL, WEST MIDLANDS,
B93 9ES, ENGLAND.

AARDVARK — THE ADVENTURE PLACE

ADVENTURES FOR OSI, TRS-80, TRS-80 COLOR, SINCLAIR, PET, VIC-20

ADVENTURES — Adventures are a unique form of computer game. They let you spend 30 to 70 hours exploring and conquering a world you have never seen before. There is little or no luck in Adventuring. The rewards are for creative thinking, courage, and wise gambling — not fast reflexes.

In Adventuring, the computer speaks and listens to plain English. No prior knowledge of computers, special controls, or games is required so everyone enjoys them—even people who do not like computers.

Except for Quest, itself unique among Adventure games, Adventures are non-graphic. Adventures are more like a novel than a comic book or arcade game. It is like reading a particular exciting book where you are the main character.

All of the Adventures in this ad are in Basic. They are full featured, fully plotted adventures that will take a minimum of thirty hours (in several sittings) to play.

Adventuring requires 16k on Sinclair, TRS-80, and TRS-80 Color. They require 8k on OSI and 13k on VIC-20. Sinclair requires extended BASIC.

TREK ADVENTURE by Bob Retelle — This one takes place aboard a familiar starship and is a must for trekkies. The problem is a familiar one — The ship is in a "decaying orbit" (the Captain never could learn to park!) and the engines are out (You would think that in all those years, they would have learned to build some that didn't die once a week). Your options are to start the engine, save the ship, get off the ship, or die. Good Luck.

Authors note to players — I wrote this one with a concordance in hand. It is very accurate — and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

CIRCLE WORLD by Bob Anderson — The Alien culture has built a huge world in the shape of a ring circling their sun. They left behind some strange creatures and a lot of advanced technology. Unfortunately, the world is headed for destruction and it is your job to save it before it plunges into the sun!

Editors note to players — In keeping with the large scale of Circle World, the author wrote a very large adventure. It has a lot of rooms and a lot of objects in them. It is a very convoluted, very complex adventure. One of our largest. Not available on OSI.

HAUNTED HOUSE by Bob Anderson — This one is for the kids. The house has ghosts, goblins, vampires and treasures — and problems designed for the 8 to 13 year old. This is a real adventure and does require some thinking and problem solving — but only for kids.

Authors note to players—This one was fun to write. The vocabulary and characters were designed for younger players and lots of things happen when they give the computer commands. This one teaches logical thought, mapping skills, and creativity while keeping their interest.

DERELICT by Rodger Olsen and Bob Anderson — For Wealth and Glory, you have to ransack a thousand year old space ship. You'll have to learn to speak their language and operate the machinery they left behind. The hardest problem of all is to live through it.

Authors note to players — This adventure is the new winner in the "Toughest Adventure at Aardvark Sweepstakes". Our most difficult problem in writing the adventure was to keep it logical and realistic. There are no irrational traps and sudden senseless deaths in Derelict. This ship was designed to be perfectly safe for its' builders. It just happens to be deadly to alien invaders like you.

NUCLEAR SUB by Bob Retelle — You start at the bottom of the ocean in a wrecked Nuclear Sub. There is literally no way to go but up. Save the ship, raise her, or get out of her before she blows or start WWIII.

Editors note to players—This was actually plotted by Rodger Olsen, Bob Retelle, and someone you don't know — Three of the nastiest minds in adventure writing. It is devious, wicked, and kills you often. The TRS-80 Color version has nice sound and special effects.

EARTHQUAKE by Bob Anderson and Rodger Olsen — A second kids adventure. You are trapped in a shopping center during an earthquake. There is a way out, but you need help. To save yourself, you have to be a hero and save others first.

Authors note to players — This one feels good. Not only is it designed for the younger set (see note on Haunted House), but it also plays nicely. Instead of killing, you have to save lives to win this one. The player must help others first if he/she is to survive — I like that.

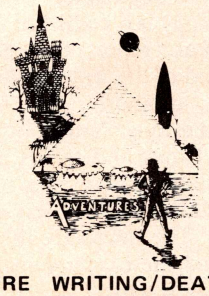
PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

QUEST by Bob Retelle and Rodger Olsen — THIS IS DIFFERENT FROM ALL THE OTHER GAMES OF ADVENTURE!!!! It is played on a computer generated map of Alesia. You lead a small band of adventurers on a mission to conquer the Citadel of Moorlock. You have to build an army and then arm and feed them by combat, bargaining, exploration of ruins and temples, and outright banditry. The game takes 2 to 5 hours to play and is different each time. The TRS-80 Color version has nice visual effects and sound. Not available on OSI. This is the most popular game we have ever published.

MARS by Rodger Olsen — Your ship crashed on the Red Planet and you have to get home. You will have to explore a Martian city, repair your ship and deal with possibly hostile aliens to get home again.

Authors note to players — This is highly recommended as a first adventure. It is in no way simple—playing time normally runs from 30 to 50 hours — but it is constructed in a more "open" manner to let you try out adventuring and get used to the game before you hit the really tough problems.



ADVENTURE WRITING/DEATHSHIP by Rodger Olsen — This is a data sheet showing how we do it. It is about 14 pages of detailed instructions how to write your own adventures. It contains the entire text of Deathship. Data sheet - $3.95. NOTE: Owners of OSI, TRS-80, TRS-80 Color, and Vic 20 computers can also get Deathship on tape for an additional $5.00.

PRICE AND AVAILABILITY:

All adventures are $14.95 on tape except Earthquake and Haunted House which are $9.95. Disk versions are available on OSI and TRS-80 Color for $2.00 additional.

Please specify system on all orders

ALSO FROM AARDVARK — This is only a partial list of what we carry. We have a lot of other games (particularly for the TRS-80 Color and OSI), business programs, blank tapes and disks and hardware. Send $1.00 for our complete catalog.

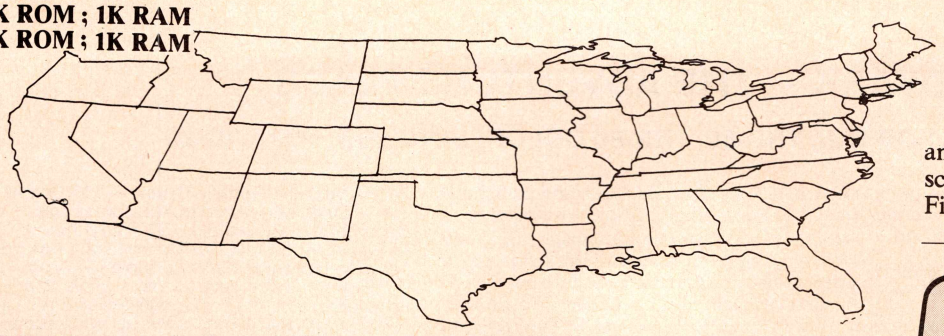
AARDVARK - 80
2352 S. Commerce, Walled Lake, MI 48088
(313) 669-3110

VISA master charge

Phone Orders Accepted 8:00 a.m. to 4:00 p.m. EST. Mon.-Fri.

TRS-80 COLOR **SINCLAIR** **OSI** **VIC-20**

8K ROM ; 1K RAM
4K ROM ; 1K RAM



Maps and the ZX80/81

Harry Doakes

Think about maps for a minute. We see them in one form or another almost every day, but we usually do not think about them even though there are some highly sophisticated theories about maps. We simply use them. We just want to figure how to get from here to there.

On a computer, however, a map is something we have to think about. Many computer games—and other applications, too—use maps to store and represent information. In this article, we will examine some ways of putting maps into your ZX80 or ZX81. We will also see how the Sinclair computers can generate complex maps by themselves.

Starting at the Beginning

What exactly is a map? Let us define it at this point as a representation of a group of places and of the ways of getting from one place to another.

One of the most familiar types is the road map. Cities and towns marked on the map with different types of dots; the roads are shown as lines of various sizes and colors. The towns are the places on the map, and the roads connect each of them to other towns.

One of the defining characteristics of a map is that every place on the map must be connected, somehow, with every other place on the map. Maybe the connection will not be direct. On a road map, for example, the route from town A to town B might lead through several other towns along the way. But, if you literally "can't get there from here," the two places are not really on the same map.

Actually, most road maps contain plenty of other information besides locations of towns and roads. For example, since a road map is usually a picture of an entire region, it also shows such features as rivers and lakes.

In addition to those extra details, all the distances on a road map are usually to scale. "To scale" means that distances on the road map are proportional to the distances in the real world. Thus one inch on the map might represent ten miles in the real world. That may seem pretty obvious, but not all maps are drawn to scale. Many do not need to be.

Concentration

A map drawn to scale contains a lot of information concentrated in a relatively small space. We scan the map quickly and get the information we need fast. That is, we process the information the map contains visually.

The very complete to-scale map is not nearly so useful to a computer though. To understand why, think about what you do to figure out how far it is from New York to Los Angeles.

1) You open up the map.
2) You find New York.
3) You find Los Angeles.
4) You measure the distance between the two cities.

Now think about what a computer has to go through to do the same thing:

1) It has to scan the entire map, one small section at a time, to look for New York.

2) It must repeat the whole process to find Los Angeles.

3) Having figured out where the two cities are, it has to measure the distance between them. Generally that is the easiest part of the task.

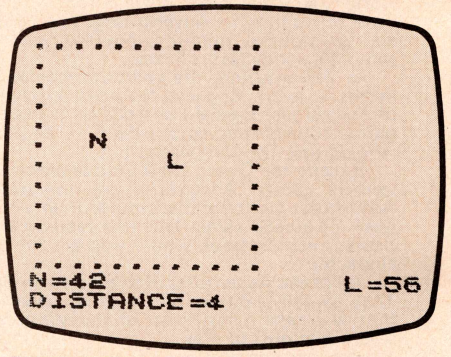
But before any of that happens, the computer must be able to scan the map. Since this generally means the map must be stored in the memory of the computer, lots of memory is required, much more than is reasonable for something as simple as figuring out how far it is between two cities.

The simple truth is this: human beings are good at processing visual information. Computers are not. As a result, the best kind of map for a human being may be the worst sort of map for a computer.

A Computer Map

The simplest kind of computer map is the equivalent of a map actually drawn on a piece of paper. For example, enter and run the program in Listing 1. Your screen display should look something like Figure 1.

Figure 1.



Listing 1.

8K ROM

```
 10 LET L=INT (RND*100)
 20 LET N=INT (RND*100)
 30 IF N=L THEN GOTO 20
 40 PRINT ".........."
 50 FOR A=0 TO 9
 60 PRINT ".";
 70 FOR B=0 TO 9
 80 LET A$=" "
 90 IF 10*A+B=N THEN LET A$="N"
100 IF 10*A+B=L THEN LET A$="L"
110 PRINT A$;
120 NEXT B
130 PRINT "."
140 NEXT A
150 PRINT ".........."
```

Changes for 4K ROM

```
 10 LET L=RND(100)-1
 20 LET N=RND(100)-1
```

This is a randomly generated map of New York and Los Angeles. The "N" represents New York, and the "L" Los Angeles.

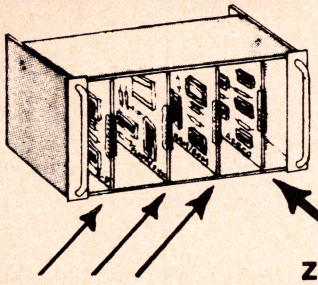
It certainly looks like a map—a sort of map, anyway. And it is relatively easy for a human brain to understand. But it is not nearly so easy for a computer to work with. Remember that, using just the map, a computer calculating the distance between the two cities would have to scan every space on the map to find each of the cities. That is not too large a problem on a tiny map of 100 spaces. But for a map representing the entire United States, featuring a significant number of cities, it would take lots of time—and lots of memory.

A human brain has a huge capacity for processing and storing information, but a computer (especially a small, personal-size computer like the Sinclair) does not have the luxury of all that spare memory. For most computerized maps, drawing out the map for the computer to work with will not be very helpful.

A More Coordinated Version

The computer has several ways of handling this information instead of actually drawing out a map. One is to assign coordinates to each important place on the map. In Listing 1, for example, lines 10 and 20 assign a random position to

Harry Doakes, PO Box 10860, Chicago, IL 60610.



X-PAND THE SINCLAIR...

Floppy Disc
Hi-Res Vid.
Printer
Plotter
Memory
Speech
Modem
A-D
D-A
Etc. Etc.
From over 50 manuf.

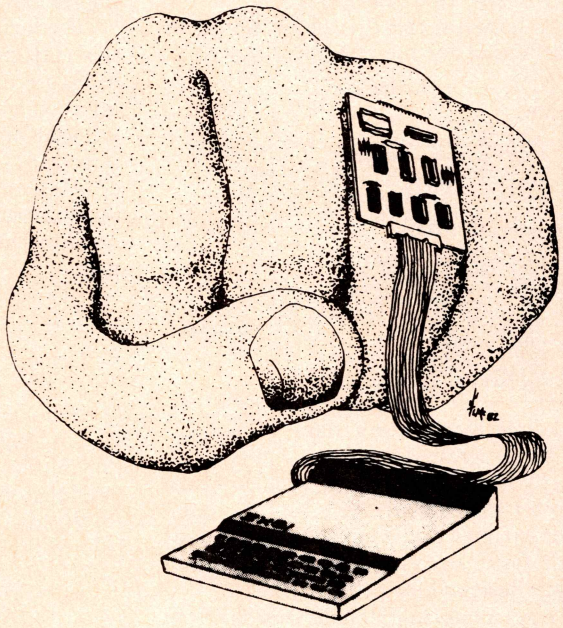
ZX-STD BUS INTERFACE

- *ON-BOARD MEMORY EXPANSION OPTION*
- *MEMORY-MAPPED PORTS*
- *PROVIDES POWER TO ZX*
- *ALLOWS OVER 6M CABLE*
- *HI-POWER BUS BUFFERS*
- *DELIVERY FROM STOCK*

$79 *ASSM. & TESTED*

OPTIONS:

- *CONVERT ZX EDGE CON. TO RIBBON HEADER $30*
- *2K RAM EXPANSION $15*
- *4K RAM EXPANSION $25*



AERCO

BOX 18093 AUSTIN
TX 78760-8093
(512) 385-7405

ABERSOFT

7 MAESAFALLEN, BOW ST, DYFED, SY24 5BA

ZX81 & Spectrum Games

Now NEW LOW prices!!!!

PROGRAM	PRICE
Chess 1.4 10 levels m/c	$17.95
Adventure 140 locations based on the original	$17.95
Invaders Fast m/c arcade action	$8.95
Mazeman All the features of the original arcade version m/c	$8.95

Add $2.00 for postage/handling

OMNI TEMPLATE

FOR ZX-80 and ZX-81

WHAT IS OMNI TEMPLATE?
It is a template program for generating other programs. While developing programs, our staff needed a collection of general utilities to avoid the burden of repeating the same routines over and over. This gave birth to **OMNI TEMPLATE.** We found it so effective that we decided to share it with others.

WHY SHOULD YOU HAVE IT?
It is a great training tool. It helps you to develop a habit of writing professional-looking programs rather than rag-tag patch works. It makes programming fun.

WHAT DO YOU GET?
You will receive a cassette tape of **OMNI TEMPLATE** Program prerecorded and ready to use. Three additional programs: RACING, INDEX-CARDS and FIT-POINTS, which were developed by **OMNI TEMPLATE,** are on the tape in addition to **OMNI TEMPLATE.** A complete listing of **OMNI TEMPLATE** and a well-documented manual describing how to use **OMNI TEMPLATE** is included.

HOW DO YOU GET OMNI TEMPLATE?
It is **$9.50,** if ordered before December 1, 1982. It becomes $14.50 after that. Please add $1.00 for shipping and handling. Send money order or check to:

Omni Technology
P.O. Box 10630
Pittsburgh, Pa 15235

PA resident please add 57 cents for PA sales tax.

each of the two cities. Finding the distance between the two cities would be much easier for the computer if it could

Listing 2.

8K ROM

```
160 LET A=INT (N/10)-INT (L/10)
170 LET B=N-L-10*A
180 LET A=INT SQR (A*A+B*B)
190 PRINT "N=";N,"L=";L
200 PRINT "DISTANCE=";A
```

Changes for 4K ROM

```
 10 LET L=RND(100)-1
 20 LET N=RND(100)-1
160 LET A=N/10-L/10
180 LET C=A*A+B*B
190 IF A<0 THEN LET A=-A
200 IF NOT C>A*A THEN GO TO 230
210 LET A=A+1
220 GO TO 200
230 PRINT "N=";N,"L=";L
240 PRINT "DISTANCE=";A
```

deal directly with the variables N and L.

The program in Listing 2 lets it do exactly that. This time, there is no visual map for the human being, but the computer can give us the information we want much faster because it is working with a map is designed for it.

To get a human-readable version of the map at the same time, combine the two programs into one—none of the line numbers will conflict—and run the resulting program. In one sense, what we have done in the second program is to eliminate all the "white space" from the first map. Only the pertinent information is left.

The Real World

In most computer games, it is assumed that the whole universe is divided up into squares, and that you always move from one square to the next. This a system lends itself well to simple maps.

If you are pretending to fight monsters or shoot aliens, it may work fine, but the real world is not so convenient. Consider an airline route map, for example. You can create a computer map that shows all the territory between cities, but there is not much point in that since airplanes always fly directly from one place to another. All that "white space" just gets in the way. Remember what a map is: simply a group of interconnected places.

Suppose you want to make an airline map containing New York and Los Angeles. You might do it like this:

Places:	Routes:
New York (NY)	NY-LA: 2800 miles
Los Angeles (LA)	

You might also include another route—LA-NY: 2800 miles. In this case it is safe to assume that the route goes in both directions, but that is not always true. If you were making a map of a plumbing system or a circuit board, it might be important to know which way everything was moving. For now, though, assume that there are no one-way routes.

Bigger and Better

Of course, there is no reason to limit this map to two cities. Let's expand it as in Figure 2. This looks like a long list of interconnections, but actually it is rather straightforward. In a computer, the important information—the distances—could be represented in a single one-dimensional array which requires far less memory than an accurately scaled visual map.

Figure 2.

Places:	Route:	Miles
(1) New York	(1) NY-LA	2800
(2) Los Angeles	(2) NY-Ch	840
(3) Chicago	(3) NY-Ho	1650
(4) Houston	(4) NY-Bo	220
(5) Boston	(5) NY-SF	3040
(6) San Francisco	(6) LA-Ch	2100
	(7) LA-Ho	1550
	(8) LA-Bo	3050
	(9) LA-SF	410
	(10) Ch-Ho	1100
	(11) Ch-Bo	1000
	(12) Ch-SF	2410
	(13) Ho-Bo	1860
	(14) Ho-SF	1950
	(15) Bo-SF	3170

The Traveling Salesman

Now suppose you are a salesman who has to visit six cities, beginning in one of them and ending in the same city you started from. How can you find the route that requires the least amount of traveling, that is, the route that covers the shortest distance? (This is a variation of the old "traveling salesman" problem.)

We find that there are six-factorial possible routes. (Six-factorial, or 6, means 6x5x4x3x2x1, or 720.) Some of these are virtually identical, following the same route but starting in a different city, or running the route backwards. But even after eliminating duplication, there are still 60 different possibilities to choose from. Which one is shortest?

You could figure out all the possible routes, if you had lots of paper and lots more time. However, with this map of the six cities, it is easy for the computer to figure out every route and then tell you which circuit is the most efficient.

Listing 3 is a program to try all the different routes. The 8K version requires over 1K RAM. To use the program on the 4K ROM, make the changes at the end of the listing.

The first lines of the program load the distances into the D array. Then P (the current "shortest distance" for the whole circuit) is set very high, and the A array is set up as 1, 2, 3, 4, 5, 6 to indicate a route through New York, Los Angeles, Chicago,

Listing 3.

8K ROM

```
  1 REM 2800,0840,1650,0220,304
0,2100,1550,3050,0410,1100,1000,
2410,1860,1950,3170
 10 DIM A(7)
 20 DIM D(15)
 30 FOR D=1 TO 15
 40 FOR A=16509 TO 16512
 50 LET D(D)=10*D(D)+PEEK (5*D+
A)-28
 60 NEXT A
 70 NEXT D
 80 LET P=32767
 90 FOR A=1 TO 6
100 LET A(A)=A
110 NEXT A
120 GOSUB 1000
130 FOR D=1 TO 4
140 LET N=6-D
150 FOR A=N TO 5
160 IF A(A+1)>A(A) THEN GOTO 20
0
170 NEXT A
180 NEXT D
190 STOP
200 LET A(N)=A(N)+1
210 FOR A=1 TO N-1
220 IF A(A)=A(N) THEN GOTO 200
230 NEXT A
240 LET N=N+1
250 IF N=7 THEN GOTO 120
260 LET A(N)=1
270 GOTO 210
1000 LET R=0
1005 LET A(7)=A(1)
1010 FOR D=1 TO 6
1020 LET Q=0
1030 FOR A=1 TO 5
1040 FOR B=A+1 TO 6
1050 LET Q=Q+1
1060 IF A(D)=A AND A(D+1)=B OR A
(D)=B AND A(D+1)=A THEN GOTO 110
0
1070 NEXT B
1080 NEXT A
1090 RETURN
1100 LET R=R+D(Q)
1110 NEXT D
1120 IF R>P THEN RETURN
1130 IF R<P THEN CLS
1140 LET P=R
1150 FOR A=1 TO 7
1160 PRINT A(A);
1170 NEXT A
1180 PRINT TAB 8;P
1190 RETURN
```

Changes for 4K ROM

```
  40 FOR A=16422 TO 16425
  50 LET D(D)=10*D(D)+PEEK(5*D+A
)-28
1180 PRINT ,P
```

Houston, Boston, San Francisco, and then back to New York. The rest of the main program simply generates a new route each time, while the subroutine beginning at line 1000 calculates how long each route is.

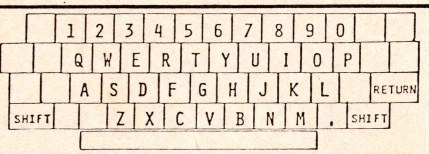
It should only take about three minutes for a ZX80 to come up with the shortest route.

Trees

It should be clear by now that different kinds of maps are useful for different purposes. For a human being to find the right highway, a road map works just fine. For a computer to solve the "traveling salesman" problem, we saw a better kind of map.

A third type that has a very specialized use is the "tree-structured" map. Remember what the defining characteristic of any map is: it represents a group of interconnected things. A tree-structured

KEYBOARDS



WHY BUY A FULL-SIZED KEYBOARD FROM DOUBLE H *ELECTRONICS* ?

HERE IS WHAT SOME OF OUR CUSTOMERS SAY :

THE KEYBOARD ATTACHED IN LESS THAN 20 MINUTES AND WORKED LIKE A CHARM....G.G.

Keyboard comes fully assembled and tested and ready for you to connect to your computer. Detailed instructions are included.

SERVICE: PHENOMENAL. RECEIVED KEYBOARD IN UNBELIEVABLE TIME - SEVEN DAYS AFTER MAILING THE ORDER....L.B.

We ship all orders, paid by money order, on the next business day. All inquiries are also answered the next day.

LIKED MY KEYBOARD SO MUCH, THAT WHEN I TOLD MY BROTHER ABOUT IT, HE HAD TO HAVE ONE TOO....M.V.

Many of our orders are repeat business.

IMPRESSED WITH KEYBOARD. SPECIAL CIRCUITS PLANS ARE EXPLICIT AND COMPLETE. NOW SEND PARTS KIT....L.B.

Over 25% of our customers come back for the parts kit if they didn't get it right away. Parts kit is needed only for our special features described below, but they are great!

THIS A NEW, SURPLUS, 53 KEY, GOLD CONTACT, FULL STROKE KEYBOARD, ORIGINALLY MADE FOR A TEXAS INSTRUMENTS COMPUTER TERMINAL. HAS SPACE BAR, 2 OVERSIZED SHIFT KEYS AN OVERSIZED RETURN (ENTER) KEY AND 12 SPARE KEYS WHICH CAN BE USED FOR THE SPECIAL CIRCUITS DESCRIBED BELOW. AN OPTIONAL PARTS KIT IS AVAILABLE WITH ALL THE ELECTRONIC PARTS REQUIRED. (IC'S, RESISTORS, IC SOCKETS, CAPACITORS, ETC) YOU PROVIDE ONLY SOLDER, WIRE, AND A SMALL PIECE OF PERF-BOARD FOR ASSEMBLY. THE KEYBOARD COMES FULLY ASSEMBLED AND READY TO CONNECT TO YOUR ZX80/81/MICROACE VIA A 13 CONDUCTOR RIBBON CABLE (SUPPLIED). THE EXPANSION CONNECTOR IS LEFT FREE FOR USE WITH PRINTER, ADDITIONAL MEMORY, ETC. EACH KEYBOARD COMES WITH FULL PLANS AND DIAGRAMS FOR THE FOLLOWING SPECIAL CIRCUITS:

ELECTRONIC SHIFT-LOCK WITH LED INDICATOR- allows you to lock the keyboard in the shifted mode. Simplifies graphics.

AUTO-REPEAT WITH LED INDICATOR-once activated, you can hold any key down and it will repeat until released. Makes it easy to move cursors quickly, draw graphics, delete words-phrases-lines.

AUTO-SHIFT FOR SELECTED FUNCTIONS-you select which shifted functions like: cursors,",=,$,+ etc.you want to place on dedicated keys. Pressing just that key will enter the function. The circuit does the shifting for you, electronically. Our parts kit contains enough parts to dedicate 10 keys.

$46.00 COMPLETELY ASSEMBLED KEYBOARD & PLANS FOR THE SPECIAL CIRCUITS
Shipping, insurance, handling please add the following:
U.S., APO-FPO(PAL) $3, CANADA $6, ALL OTHER FOREIGN $12
Texas residents add $2.53 state sales tax.
FOR PARTS KIT ADD $13 and an additional $1 for postage/handling
Texas residents add $.72 additional sales tax.

DOUBLE H *ELECTRONICS*
195 LELANI
SAN ANTONIO, TX 78242

ALL PRICES ARE $ U.S. AND ONLY U.S. DOLLARS CAN BE ACCEPTED. MONEY ORDER OR CASHIERS CHECK PREFERRED. PERSONAL CHECKS MUST CLEAR BEFORE SHIPMENT.

50 NIFTY 1K PROGRAMS FOR THE ZX81

A large variety of great games, interesting activities, and plenty of graphics, providing hours of fun for the whole family.

Also available — 50 nifty programs for your Timex 1000. Same great programs. But upgraded for 2K machine. The result is very user friendly with additional levels of play.

$9.95 each includes postage/handling

Listings and cassettes available: send sase for free catalogue.

JENN PRODUCTS
BOX 246
HARRISON, ME. 04040

YORK 10 BASF-DPS

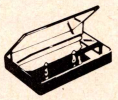
WORLD STANDARD TAPE

MONEY BACK GUARANTEE

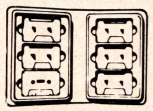
PREMIUM 5-SCREW SHELL FITS ALL STANDARD RECORDERS

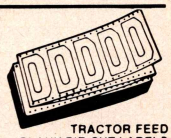
COMPUTER GRADE BLANK CASSETTES

DATA TRAC / C-05, C-10, C-20


PHILIPS (NORELCO) TYPE HARD BOXES

SOFT PROPYLENE HINGED BOXES


6 CAPACITY CASSETTE ALBUMS


TRACTOR FEED BLANK DIE-CUT LABELS

HERE'S WHAT USERS SAY ABOUT YORK 10 CASSETTES:

"We monitored the output to the computer with a specially built meter and found absolutely no dropouts throughout the tape . . ."
Stace Papadopoulos
Beaverton, OR

"It's nice to have a tape you can rely on 100% of the time to perform with such quality. And the fast, courteous service was a pleasant surprise."
Tom Parkinson
Madison, OH

"Your price is slightly higher than the competition, but your quality is vastly superior . . ."
F. L. Brandon
Greenville, TX

"Your price is right – your service and quality is excellent. We'll be doing business again!"
Richard P. Thrun
APO New York

YOU'VE TRIED THE REST, NOW BUY THE BEST"

VISA **Call: 213/710-1430** for IMMEDIATE SHIPMENT on Credit Card Orders. MasterCard

ORDER NOW . . . **YORK 10 Computerware**
MAIL TO: 24573 Kittridge St., Dept. S-2 Canoga Park, CA 91307

ORDER FORM

ITEM	1 DOZEN	2 DOZEN	TOTAL
C-05	☐ 7.50	☐ 13.50	
C-10	☐ 8.00	☐ 14.40	
C-20	☐ 10.00	☐ 18.00	
Hard Box	☐ 2.50	☐ 4.00	
Soft Box	☐ 2.00	☐ 3.40	
6 Cap. Album @ $6.95 each	quantity _____		
Blank labels	☐ 4.00/100	☐ 30.00/1000	
		SUB TOTAL	
Calif. residents add 6% sales tax			
Shipping 1 doz. $2; 2 doz. $3.50; 3 doz. $4.50 each additional doz. $.50			
For Parcel Post instead of UPS ADD $1			
Outside Continental USA, ADD $2			
		TOTAL	

Each cassette includes two YORK 10 labels only. Boxes are sold separately. Shipments are by UPS unless Parcel Post requested.

Boxes, albums, & blank labels are free of shipping charges when ordered with cassettes. When ordered separately Minimum shipping is $2.00

PLEASE SEND QUANTITY DISCOUNTS ☐

Check or M.O. enclosed ☐ **Charge to Credit Card:** ☐ **VISA** ☐ **MASTERCHARGE**

Card No. Exp.

Name

Address

City State/Zip

Signature

Computer make & model

SAVE YOUR SOFTWARE $$

$11.95 FOR 4

If you have space problems, PACK!! PACK will store 4500 (+) 8 digit entries in 16K. Try to get *that* anywhere else!!

CHART YOUR BUDGET
Don't just enter your monthly income and expenses, TRACK your progress Year - to- Date. Uses unique PLOT arithmetics and screen layout for each account. Up to 14 accounts and EXPANDABLE!
Menu & INKEY driven 16K

CLIENT MASTER
Do you have clients, friends, credit cards? Hold all infor (Acc#, Tel#, Addr) for each. ADD/DEL/LIST/ CHG/ SEARCH your file in seconds. Excellent education in large-scale program management as well. 16K

CRAPS — All work and no play makes Jack a dull programmer! Fun for the family.

Send check to: OVERBYTE - 902 S.E. 24th Ave, Cape Coral, Florida. 33904
Cassette(s) will be mailed within 3 days.

ARTIST

ARTIST is a ZX81 (16K RAM) program that, with more than 30 commands, helps create drawings/ paintings on screen. Features include: user's choice of brushes and backgrounds; free mix of graphics and alphanumerics; easy graphic specification of lines, circles and half-circles; ability to define, store and recreate complex patterns anywhere on the screen; ability to save the artwork on tape or print it.

ARTIST is very easy to learn and use. 4-years old kids master its basic commands in minutes. At the same time, advanced features support the creativity of sophisticated users, which can define their own commands; for them, ARTIST offers an extensive graphic command language.

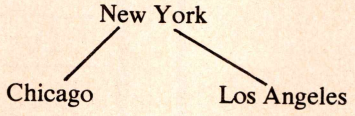
Cassette and instructions — $10 ($12 outside U.S.).
From: KSOFT, 845 Wellner Rd, Naperville, Ill 60540.

map has one additional characteristic: the map begins with a single place (or thing), and exactly one new connection is made for each new place (or thing) on the map.

The best way to understand this type is with an example. Let's start out with a map like this:

New York

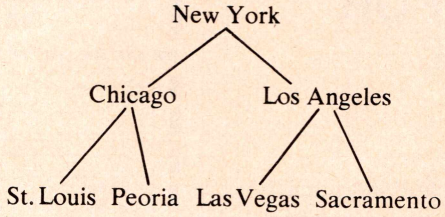
True this is not much of a map, but now add some more cities:



Notice that the new cities are connected to New York, but not to each other. Why not? Think about the definition of a tree-structured map. It starts out with one place—New York. Then, with each city added to the map, exactly one new connection is made. Thus there will always be more cities than connections—exactly one more, in fact.

Let's make the map still larger as in Figure 3. Once again, there is just one new connection for each new city. One way of looking at this is to say that each new city connects to exactly one previously existing city.

Figure 3.

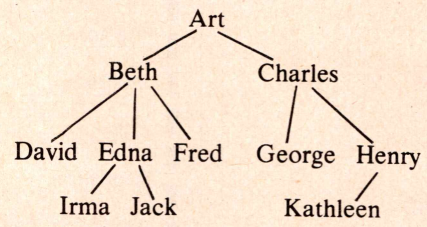


Shaking the Family Tree

How useful can a map like this be? Not very, if you are looking for a road map. Most cities are a little better connected than that.

But consider for a moment a family tree. It works exactly like a tree-structured map. For example, Figure 4

Figure 4.



shows a visual map of a family tree covering four generations. If we consider this tree structure as a map with places and routes (the places are people, and the routes are lines of parentage), it will look like this:

Places:	Routes:
Art	
Beth	Art to Beth
	Art to Charles
David	Beth to David
Edna	Beth to Edna
Fred	Beth to Fred
George	Charles to George
Henry	Charles to Henry
Irma	Edna to Irma
Jack	Edna to Jack
Kathleen	Henry to Kathleen

As you would expect in a family tree, each new person is the son or daughter of exactly one person already in the tree. That means there will be just one new connection for each new person; the number of connections is one less than the number of family members.

Counting Off

Now suppose we give everyone in our family tree a number, beginning with zero, and each family connection a number, beginning with one. Since there is one more family member than connections, we find that the member and the connection have the same number. The result looks like this:

Places:	Routes:
(0) Art	
(1) Beth	(1) (0,1)
(2) Charles	(2) (0,2)
(3) David	(3) (1,3)
(4) Edna	(4) (1,4)
(5) Fred	(5) (1,5)
(6) George	(6) (2,6)
(7) Henry	(7) (2,7)
(8) Irma	(8) (4,8)
(9) Jack	(9) (4,9)
(10) Kathleen	(10) (7,10)

Now something else becomes obvious: the second element of each pair matches the route number. Why? Because a tree structure gets bigger by one place and one route at a time. Each new place connects, by a new route, to some previous place. Each new family member is the son or daughter of exactly one previous family member.

This map is significantly different from the one we made of the six cities. For that map, we got all the distances into one array, but to do it we used the program-

ming trick found in lines 1030-1080. The trick was necessary to fit the program into 1K, but it is still a trick.

With a tree structure, there is no gimmick involved. We really can represent the entire map in a single one-dimensional array which is a very memory-efficient way of making a very complex and extensive map of a tree.

A-Maze-Ment

If a carefully constructed map of the tree type be stored as an array, why not stand the process on its head? We should be able to use an array full of random numbers as a maze.

We must keep a few things in mind. First, the random numbers have to be chosen within the right range. Remember, every place on a map has to connect, directly or indirectly, with every other place. Second, to keep the maze from being too easy we should scramble some of the connections and add some extra cross-connections to the basic tree structure.

A program that does all of these things and puts them together to generate a complex random maze of almost any size is given in Listing 4. The 8K ROM version requires over 1K RAM. To use on the 4K ROM, make the changes at the end of the listing.

Listing 4.

8K ROM

```
  10 PRINT "NUMBER OF ROOMS?"
  20 INPUT N
  30 DIM D(2*N)
  40 FOR A=1 TO N
  50 IF A=1 THEN LET D(A)=0
  60 IF A>1 THEN LET D(A)=INT (R
ND*(A-1))+1
  70 NEXT A
  80 FOR A=N+1 TO 2*N
  90 LET D(A)=INT (RND*N)+1
 100 IF D(A)=A-N THEN GOTO 90
 110 IF RND>.5 THEN GOTO 150
 120 LET L=D(A)
 130 LET D(A)=D(A-N)
 140 LET D(A-N)=L
 150 NEXT A
 160 LET Q=INT (RND*N)+1
 170 CLS
 180 PRINT "YOU ARE ";
 190 IF Q>0 THEN GOTO 220
 200 PRINT "OUTSIDE--YOU MADE IT
"
 210 STOP
 220 PRINT "IN ROOM ";Q;" WITH "

 230 GOSUB 400
 240 PRINT 2*N-L;" DOORS.  WHICH
DOOR?"
 250 INPUT L
 260 GOSUB 410
 270 IF L<>0 THEN GOTO 250
 280 IF Q=D(A) THEN GOTO 310
 290 LET Q=D(A)
 300 GOTO 170
 310 LET Q=A+N*(A>N)
 320 GOTO 170
 400 LET L=2*N
 410 FOR A=1 TO 2*N
 420 IF A=Q OR A=Q+N OR D(A)=Q T
HEN LET L=L-1
 430 IF L<>0 THEN NEXT A
 440 RETURN
```

Changes for 4K ROM

```
  60 IF A>1 THEN LET D(A)=RND(A-
1)
  90 LET D(A)=RND(N)
 110 IF RND(2)=1 THEN GO TO 150
 160 LET Q=RND(N)
 270 IF L THEN GO TO 250
 430 IF L THEN NEXT A
```

The program is rather straightforward. The first FOR/NEXT loop generates a random tree structure. The second loop adds interconnections between the rooms of the maze and mixes up the doorways so it will not be as easy to find the way out. Line 160 starts the player in a random room. The subroutine beginning at line 400 or 410 is used both to count the number of doors in each room (GO SUB 400), and to find where each door leads (GO SUB 410).

It may surprise you that a maze with close to 100 rooms will fit into 1K RAM. Enter the program and try it. You will discover that finding your way through the maze is quite tricky. That is because the maze is genuinely complex: the rooms are not laid out on any kind of flat surface, but are completely random.

This type of mapped maze can be adapted for use with any game that involves a multitude of rooms or locations—caves, castles, dungeons, or haunted houses. However, it will probably require more than 1K RAM. On the other hand, this "different every time" is an interesting and challenging game in itself.

EXPAND YOUR ZX81 HORIZONS with these important books/courses!

The Complete Sinclair ZX81 Basic Course
This is probably one of the best courses on Basic available for any computer. Also contains an excellent instruction reference section.

What can I do with 1K?
You will be really surprised at what you can achieve with Roger Valentines book of Basic Programs.

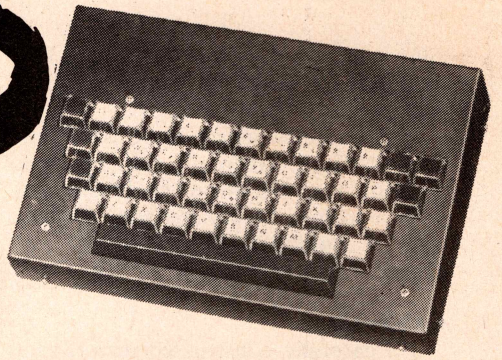
Use the Coupon below and we'll rush your order by return.

Tick Box ☐ WHAT CAN I DO WITH 1K? $14.95
Tick Box ☐ THE COMPLETE SINCLAIR ZX81 BASIC COURSE $34.95
NAME _____ ☐ SEND ME YOUR CATALOG
ADDRESS _____
CITY _____ STATE _____ ZIP _____
ADD ☐ $1.50/book UPS or ☐ 75c book 4th class mail or
☐ $8/book overseas airmail (ILL add tax)
Total Amt, Enclosed _____
OR CHARGE MY ☐ VISA ☐ MC ☐ AM EX.
CARD NO. _____ EXP. DATE _____
SIGNATURE _____
Software Masters, P.O. Box 1155, Evanston, Illinois 602 04.

GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS

Get serious about ZX81 & TS1000 Computing

with Quality Hardware and Software from Gladstone Electronics



Cassette Software

ZX FORTH

Simplicity of BASIC with the Speed of Machine Code

A complete implementation of the FORTH language for the ZX81 and TS1000 computer.
FORTH's most distinctive feature is its flexibility. The basic unit is the word — the programmer uses existing words to define his own which can then be used in further definitions. FORTH is a compiled language so programs run very fast (typically five times faster than BASIC).
ZX-FORTH is supplied on cassette and is accompanied by extensive documentation:
56-page Users Manual
8-page Editor Manual

Artic **$29.95**

ZX BUG

Machine Code Monitor and Disassembler

ZXBUG is a powerful tool for machine language programming. It is 4K long and uses memory from 71EO to the top memory. ZX BUG works in hexadecimal (base 16), not decimal, so all addresses are a maximum of 4 Hex bits long. Provides a total of 28 commands.

Artic **$14.95**

ZX ASSEMBLER

This Machine Code program occupies 7K of memory and locates itself at the top of memory. The program is a full Editor/Assembler and Monitor. Labels may be used instead of any string. The features include Line Insertion/Delete, Insert Characters, Auto Repeat on all keys. The monitor has facilities to inspect memory, registers and run machine code programs.

Artic **$14.95**

TOOLKIT

9 Powerful New Functions!

RENUMBER. This routine renumbers a program in any step and from any line up to 9999
DELETE. This command deletes a group of lines in a program.
MEMORY. Prints how much spare memory is available.
DUMP. Displays current values of string and numerical values, except arrays.
FIND. Will find any string of up to 255 characters and list each line containing that string.
REPLACE. Replaces any string of up to 255 characters by any other string.
SAVE. Transfers program in computer to below RAMTOP.
APPEND. Allows two programs to be joined.
REMKILL. Removes all REM statements from a program, otherwise leaving it unchanged, preserving memory.

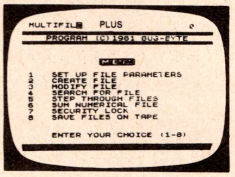
Artic **$14.95**

DATA STORAGE SYSTEM

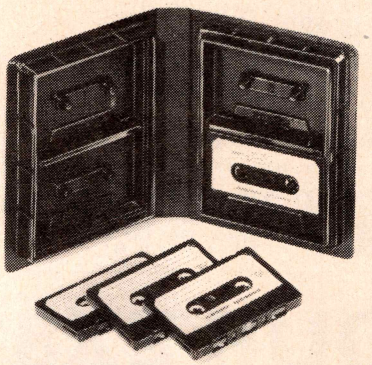
MULTIFILE PLUS

For 16K or greater ZX81

PRICE INCLUDES:
1. PROGRAM TAPE
2. 8-PAGE BOOKLET
3. THREE DATA STORAGE TAPES
4. STORAGE CASE



$34.95



Data Storage System

An amazingly versatile multi-purpose filing system for the 16K ZX81. The program is menu-driven, and number, size and headings of files are user-definable. Both string and numerical files are catered for. Files may be created, modified, replaced, and searched, and are protected by an ingenious foolproof security system. Output to the ZX printer is also provided. The program comes on cassette, together with three quality data cassettes for file storage, and comprehensive documentation, describing a host of applications for both business and personal use. Supplied in an attractive storage case. If your ZX81 is bored with playing games, then this program will give it plenty to think about!

The Complete ZX81 and TS1000 Library!

BOOKS

The Complete ZX81 Basic Course	$34.95
Basic Course Cassettes (2)	7.50
Getting Acquainted with your ZX81	8.95
ZX81 Pocket Book	10.95
Making the Most of Your ZX81	10.95
Computer for Kids, ZX81 Edition	3.95
Explorers Guide to the ZX81	10.95
ZX81 Companion	8.95
49 Exploding Games for the ZX81	10.95
Not Only 30 Programs for ZX81 : 1K	14.95
Machine Language Made Simple for Sinclair	19.95
Mastering Machine Code on your ZX81	12.95
ZX81 Rom Disassembly: Part A	14.95
ZX81 Rom Disassembly: Part B	14.95
Understanding your ZX81 ROM	19.95

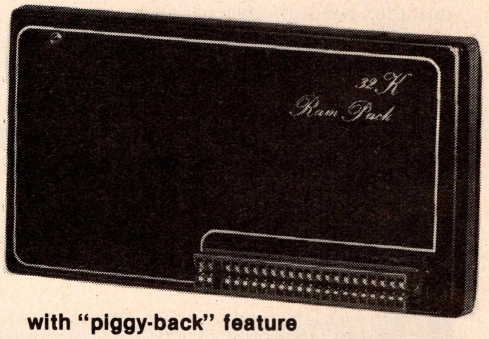
CALL OR WRITE FOR FREE CATALOG

ZX81 Professional Keyboard and Case

A full-sized professional keyboard for the ZX81 Features 47 keys and a full-sized space bar. Connects to the ZX81 with no soldering required, via a plug-in flexible connector. You can purchase the keyboard only, or the optional metal case that holds both keyboard and ZX81. Expansion devices (i.e. RAM packs, etc) connect to the ZX81 edge-connector which extends from the rear of the cabinet.
A professional keyboard makes program entry easier and less error-prone.

Keyboard (KB-1) $85.00
Metal case for keyboard and ZX81 (MC-1) $25.00

32K RAM $89.95



with "piggy-back" feature

A sensible choice for 16K RAM owners. Jigsaw 32K RAM 'piggy-backs' onto your 16K RAM to give a total memory of 48K! If you do not own a 16K RAM, you may use a 32K RAM instead. At a later date you may add the ZX81, TS1000, or Jigsaw 16K RAM, should you decide you require more memory.
A very useful, unique Jigsaw memory feature is the pilot light showing if your ZX81 computer/memory is powered.
Larger memory enables longer programs and greater data bases, enhancing the value of your personal computer. And the Jigsaw 32K is part of a fully compatible ZX81 and TS1000 system of add-on products. Additional exciting Jigsaw products to follow shortly!

64K RAM $149.95

Expands the ZX81's memory capacity to its maximum. Use instead of 16K RAM. Same features as other Jigsaw memory products including pilot light and full compatibility with other upcoming Jigsaw products.

16K RAM $49.95

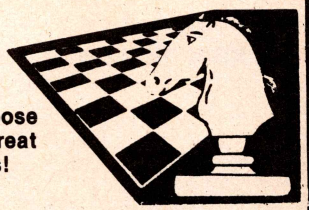
Equivalent to ZX81 or TS1000 16K RAM. Fully compatible in appearance and performance with other Jigsaw products.

GLADSTONE ELECTRONICS

Call (716) 874-5510 For Visa, MC Orders

Mail order to 1585 Kenmore Ave. Buffalo N.Y. 14217 Checks or money orders. No CODs. Add shipping

Have fun with ZX81 & TS1000 Computing



Now Choose from 3 great games!

ZX CHESS (Enhanced)

Full graphic display of chess board. Six levels of play, two of which play within competitive time limits. You choose black or white. Plays all legal moves including castling and en-passant. You can save games in progress on cassette. Displays moves of game on screen, or output yo printer, for analysis. Board can be set up in any position, you can even change sides mid-game. Clear entire board with one command: for end game analysis. Written totally in machine code, ZX CHESS (Enhanced) is a superb game for the advanced chess player.

16K **$12.95**

ZX CHESS II (CHESS MASTER)

The strongest chess game available on ZX81. ZXCHESS II has not ben beaten. All the features of ZX CHESS (Enhanced), plus much more. Has a book of 32 opening moves. Can play at 7 levels, four of which play within competition time limits. A move is suggested by the ZX81 if requested.

16K. **$24.95**

1K ZX CHESS

A good introduction to chess for 1K ZX81/TS1000 owners. Even within this limited memory space, a full graphic representation of the chess board is included. Single level of play. Does not accept castling or en-passant moves. **$12.95**

Introducing KRAKIT*

The Ultimate Adventure

With a 10,000 pounds sterling (real money!) pay-off

'MY SON,by the time you receive this package, I will be dead. This is my legacy to you. All my life I have worked hard to make a living and save money for your future. As you know I was an international courier. Contained on this cassette are 12 clues of an international flavor, which will furnish you with the information to gain access to a bank account. In that bank account is a minimum sum of 10,000 pounds sterling, which I have accumulated on your behalf over the years. The longer the sum remains in the account the greater the amount will become. I could have bequeathed the money to you, but I feel it is in your interest to solve these clues. Then I will feel you are mature enough an adult to handle this legacy.

God bless you always, your loving father. . .

So begins KRAKIT, the ultimate adventure and treasure hunt on the ZX81. The bank account and the prize actually exist. Crack the puzzle and the prize is yours! Krakit consists of 12 clues. In each clue there is a reference to a country, a city or town and a number. When you have solved the first clue, you will need to enter the two words and the number to release the next clue. It is necessary to solve all the clues to find the correct answer. If you do you will be supplied with two airplane tickets. When you arrive, a check for a minimum amount of 10,000 pounds sterling will be presented to you. Furthermore for every copy of Krakit sold a further dollar will be placed in the bank account.

Here is the type of clue you will find in Krakit:

'Where it all began. Where the torch was first lit. Where muscles and sinews strain. Where our heros won acclaim.

Where the symbols hold the key.'

KRAKIT.16K RAM **$19.95**

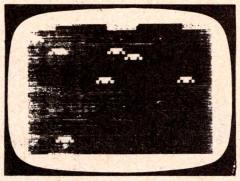
RULES. 1. The first person to be confirmed by the judges to have completed all the clues correctly will be the winner. 2. There will be one winner only. 3. No person related to I.P.S. is eligible. 4. Offer not valid where prohibited by law.

*Trademark of International Publishing & Software, Inc.

GAMES

GALAXY INVADERS

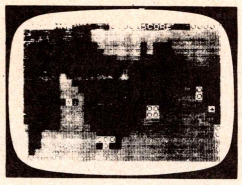
$14.95



An excellent version of the classic space game. Protect your seven lives against fleets of hostile invaders, who swoop down and attack quickly. This version is an excellent demonstration of the capabilities of the ZX81 or TS1000 to entertain and excite for hours.

ZX SCRAMBLE

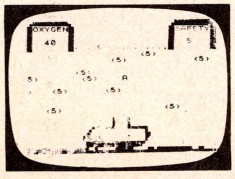
$14.95



Pilot your space craft through a fast moving, complex space maze. Watch out for missiles being fired from all directions. You can shoot back or evade them. Written in machine code for fast-paced excitement.

MARINE RESCUE

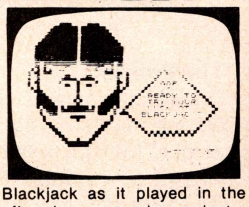
$11.95



Your ZX81 becomes the command console as a diver descends to the sunken submarine Nautilus to rescue as many of the stranded crew as possible. It's a race against time as your oxygen supply must be replenished. It's also a constant battle against marauding sharks which you can attempt to blast with your laser.

BLACKJACK

$14.95



Blackjack at its best. Blackjack as it played in the casinos of Nevada. Up to five players can play against a dealer with a fifty-two card deck. Split pairs, double down, and even buy insurance. The deck is reshuffled only when needed — allows for a continuous game. Your winnings and losings are displayed after each hand.

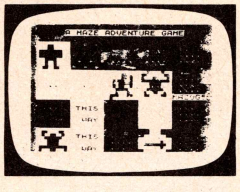
Adventure Games!

Galactic Commando	**11.95**
Crown & Scepter	**11.95**
Tank Trap	**11.95**
Slot Machine	**14.95**

MAZOGS

MAZE ADVENTURE

$9.95



A new standard in ZX81 programming. MAZOGS presents the best use of ZX81 graphics to date Written in machine code, MAZOGS is fast, exciting, and challenging!

You are confronted by a large complex maze which contains a fabulous Treasure. Within the maze are the Mazogs who will involve you in combat when you meet them. Each game begins when you meet them. Each game begins with a different randomly created maze. You will not see all of the maze. As you move through the halls, you will be startled by the quality of the graphics animation and the speed with which the game progresses.

Once you have mastered the first two levels of the game, you are ready to challenge the Maniac Mobile Mazogs who move about in a totally unpredictable manner.

To those who say the ZX81 is not a good games-player: we suggest you try your luck with Mazogs! (16K or greater)

GLADSTONE ELECTRONICS

Call (716) 874-5510 for Visa, MC Orders

ORDER FORM

CHARGE TO: ☐ VISA ☐ MASTERCARD

account number:

Expiry date

Signature

Date

Please rush me:

Quantity	Price	Total

NAME

ADDRESS

CITY: STATE: ZIP:

New York Res. add sales tax

SHIPPING

TOTAL

To: Gladstone Electronics, 1585 Kenmore Ave., Buffalo N.Y. 14217

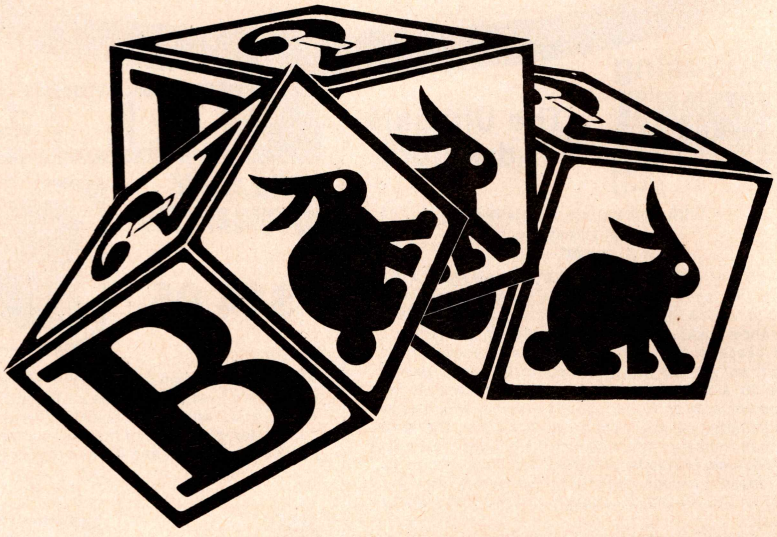
Call or write for free TS1000 & ZX81 catalog

GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS GLADSTONE ELECTRONICS

8K ROM; 2K RAM
4K ROM; 1K RAM

How Many Blocks?

Patrick Kelly



The Problem

Like most new computer owners, I was testing my new equipment with some games. My fun was interrupted, though, when I realized that I was being watched. As I turned, I was confronted by my five year-old daughter, Scooter. Wearing a sad face and eyes that reminded me of a beagle puppy, she muttered, "How 'bout me?" Needless to say, I was at a loss for words because there do not seem to be many programs available for her age bracket. The obvious solution was to write a program just for her.

Program Requirements

The first step was to outline the requirements for the program:

1) The knowledge or skill involved should be within the child's present ability to avoid excessive failure.

2) The program should be fun and game-like to hold the child's attention.

3) The program should also be educational so that the child will learn from it.

4) The means of positive/negative feedback should be within the child's present ability to comprehend.

5) The program will need minimal cues for an adult to give assistance to get the child started.

Patrick Kelly, PO Box 7162, Los Angeles, CA 90022.

Methods of Meeting the Requirements

The next step was to decide how to fulfill these requirements. Printed words were out of the question since Scooter had not learned to read or write yet. She was vaguely familiar with single printed digits and was learning to count. Pictures using the computer's graphics capabilities could also serve as a means of communication.

The Program Concept and Aim

The third step was to get the basic program concept and aim. I decided on a program to develop her abilities to count and associate the counting process with the single numerals. For positive feedback I chose the "happy face," and for the negative feedback, the "sad face." See Listing 1 for the 4K ROM program and Listing 2 for the 8K ROM.

Using the Program

Only 10 keys are involved in the child's interaction with the computer (1 to 9 and NEWLINE). I had considered making a keyboard overlay with a piece of paper marked for the ten active keys, but that would have been an open invitation to lean on the unmarked surface with the possibility of miskeying the computer. Instead I just marked the case of the computer with a small arrow pointing to the NEWLINE key and emphasized that she must touch only one key at a time. After all, learning to use the keyboard is a part of the learning exercise, too.

After entering the program, hit RUN and NEWLINE. The words "HOW MANY BLOCKS?" will appear on the first line, and a row of from one to nine blocks will be displayed on the next line. The child should count the blocks and press the key for that number and NEWLINE. If the answer is correct, the "happy face" will appear on the screen. If the answer is wrong, a "sad face" will appear. To continue, hit NEWLINE. To stop, hit any key and NEWLINE.

I hope that the pre-schoolers will enjoy this program and learn something at the same time. It is not offered as a ready-made solution for every reader. Rather it is hoped that other Sinclair users will be inspired to develop programs for a hitherto neglected user group.

Program Notes

Lines 10-70 set up the faces.

Line 100 picks the random number for the block display. On the 4K the RANDOMIZE statement is not necessary for a program on this simple level.

Lines 110 and 510 are the guides for the adult. The child will disregard them in short order.

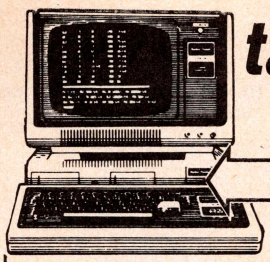
Lines 120-140 control the block display.

Line 200 inputs the child's answer.

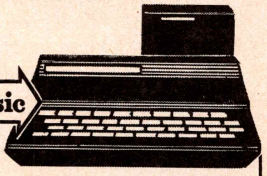
Line 210 clears the screen to prevent display overflow.

Line 220 makes sure that only a single digit is entered as the answer. A zero or multiple digits will cause the computer to re-display the previous number of blocks and request the answer again.

Line 230 decides whether the answer is right or wrong, that is, which face to display as feedback.



take the HARD WORK *out of* SOFTWARE!



Level II Basic → **COOK TransCoder I** ← Timex/Sinclair Basic

FROM COOK LABS — #1 IN CASSETTE SOFTWARE DUPLICATION

- **Translate and/or edit T/S or ZX-81 the fast, easy way.**
- **Save 75% or more of valuable programming time.**
- **RAM-to-RAM dialogue shuttles back and forth at machine speed — faster than disc.**
- **Meet the huge oncoming T/S software market by:**
  1) **translating Level II libraries automatically;**
  2) **writing and editing in either Level II or Sinclair Basic on a conventional keyboard.**

The TransCoder I comprises a combination of software and hardware. The hardware holds an 11-chip board that plugs directly into the expansion port of a R/S Model I or Model III (32K min.). The several K bytes of machine software reside in R/S high memory.

The excellent editing facilities of the host R/S computer directly apply to editing of T/S Basic programs because the T/S Basic listing will appear on the screen of the R/S monitor.

Translation of Level II Basic program listings into T/S Basic is accomplished and displayed through software on command, with directly untranslatable statements flagged for the programmer's attention. Programs can then be shuttled to T/S for final debugging and to check displays on the T/S screen.

Communication between the Radio Shack and the Timex/Sinclair operates in either direction and is non-destructive of the sending source. When completed, programs in T/S Basic can be filed on R/S disc or tape for safety and convenient reference.

The complete TransCoder I package — hardware, software, manual — is priced at only $490,* and will be available in early October. Orders will be filled in sequence as received. Please write or phone if you need more information.

*Subject to change without notice.

COOK LABORATORIES, INC.
P.O. Box 529
Norwalk, CT 06856 (Phone 203-853-3641)

☐ Send TransCoder I to address given at right. I enclose check or M.O. for $500 which includes $10 for handling & shipping (Conn. residents please add sales tax).

☐ Send information about COOK software duplication services.

NAME_____

COMPANY_____

ADDRESS_____

_____ZIP_____

Line 300 displays a "sad face." Note that on the 4K ROM version the three commas between each string make the computer skip three fields between the displaying of each graphic line so that they will line up correctly in the corner of the screen. On the 8K ROM only 2 commas are needed. This method was chosen instead of multiple print statements.

Line 310 bypasses displaying an unwanted "happy face" after the "sad face."

Line 400 displays a "happy face." All the comments on Line 300 apply here.

Line 500 spaces one line downward.

Line 600 inputs the command to continue or to stop. NEWLINE alone will cause the computer to continue.

Line 610 clears the screen for the next group of blocks and prevents display overflow.

Lines 620-640 have several functions. First, they decide whether to continue or to stop. If instructed to continue, they then decide whether the child's previous answer is right or wrong. If the answer is right, a new set of blocks will be displayed. If the answer is wrong, the previous set will be displayed again. This will continue until the correct answer is given. ■

Listing 1. How Many Blocks (4K ROM).

```
 10 LET A$="AAAAAAAAA"
 20 LET B$="A#######A"
 30 LET C$="A#WW#WW#A"
 40 LET D$="A##RWE##A"
 50 LET E$="A#W###W#A"
 60 LET F$="A##W#W##A"
 70 LET G$="A###W###A"
100 LET A=RND(9)
110 PRINT "HOW MANY BLOCKS?"
120 FOR I=1 TO A
130 PRINT "0#";
140 NEXT I
150 PRINT
200 INPUT B
210 CLS
220 IF B<1 OR B>9 THEN GOTO 11
0
230 IF B=A THEN GOTO 400
300 PRINT A$,,,B$,,,C$,,,B$,,,D
$,,,B$,,,G$,,,F$,,,E$,,,B$,,,A$
310 GOTO 500
400 PRINT A$,,,B$,,,C$,,,B$,,,D
$,,,B$,,,E$,,,F$,,,G$,,,B$,,,A$
500 PRINT
510 PRINT "HIT N/L TO CONTINUE"
600 INPUT H$
610 CLS
620 IF H$="" AND NOT B=A THEN G
OTO 110
630 IF H$="" THEN GOTO 100
640 STOP
```

Listing 2. How Many Blocks (8K ROM; over 1K RAM).

```
 10 LET A$="AAAAAAAAA"
 20 LET B$="A#######A"
 30 LET C$="A#DD#DD#A"
 40 LET D$="A##261##A"
 50 LET E$="A#D###D#A"
 60 LET F$="A##D#D##A"
 70 LET G$="A###D###A"
100 LET A=INT (RND*9)+1
110 PRINT "HOW MANY BLOCKS?"
115 PRINT
120 FOR I=1 TO A
130 PRINT "5#";
140 NEXT I
200 INPUT B
210 CLS
220 IF B<1 OR B>9 THEN GOTO 1
10
230 IF B=A THEN GOTO 400
300 PRINT A$,,B$,,C$,,B$,,D$,,B
$,,G$,,F$,,E$,,B$,,A$
310 GOTO 500
400 PRINT A$,,B$,,C$,,B$,,D$,,B
$,,E$,,F$,,G$,,B$,,A$
500 PRINT
510 PRINT "HIT N/L TO CONTINUE"
600 INPUT H$
610 CLS
620 IF H$="" AND B<>A THEN GOTO
110
630 IF H$="" THEN GOTO 100
640 STOP
```


ZX81

the BEST yet
from M.C. Associates

PELOPONNESIAN WAR

— a brand new 16K game

Your ultimate goal is a final victory over the Spartans but you will need to deploy all your skill in a combination of diplomacy and military force before you even stand a chance!

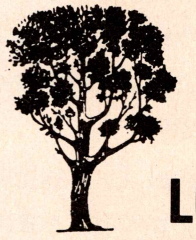
Price $14

also

TYRANT OF ATHENS (16K) Price $14
ROMAN EMPIRE (16K) Price $14

Buy more than one cassette and deduct $1 from the price of each.

Cheques or IMO's please — made payable to:
M.C. ASSOCIATES
4 GRANBY ROAD, CHEADLE HULME
CHESHIRE SK8 6LS
U.K



ZX81 16K

LOTHLORIEN
COMPUTER GAMES

New release Warlord Price $14
A16K game set in 13th Century Japan

- Can you rule a warring village to survive for 30 years?
- Can you defeat the armies and samurai of other warlords?
- A challenging game where all results are dictated by your own decision.

"SAMURAI WARRIOR"

Could you survive in 13th century Japan? (16K)

- In combat with other Samurai
- Fighting bandit groups
- Assisting villages

or will you commit ritual suicide?

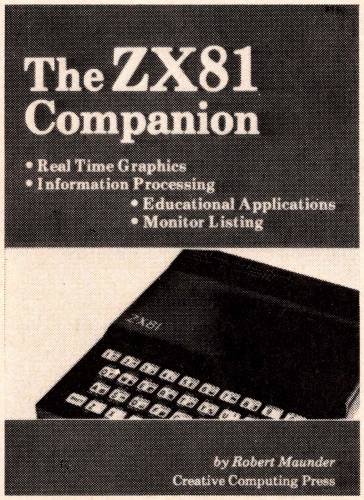
Become engrossed in this game of skill for only $14

Buy both for just $25

Cheques or IMO's please — made payable to:
LOTHLORIEN COMPUTER GAMES
94 Flixton Road, Urmston,
Manchester M31 34D
U.K

Get the most from your SINCLAIR

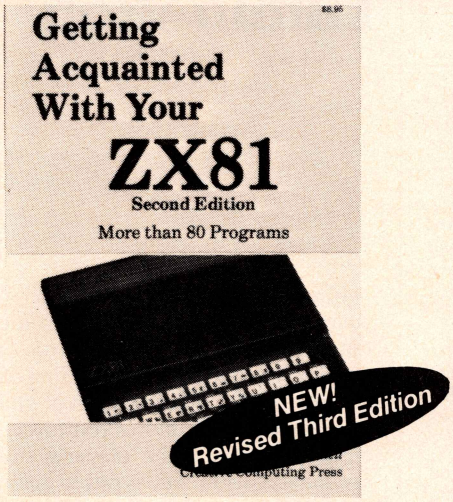
with these practical, program-filled books from *Sync*!



The ZX81 Companion
by Bob Maunder

The ZX81 Companion follows the same format as the very popular *ZX80 Companion,* and assists the ZX81 user in four applications areas: graphics, information retrieval, education and games. This practical guide contains scores of fully documented short routines plus complete programs and a disassembled listing of the ZX81 ROM Monitor. "Thoughtfully written, detailed, and illustrated with meaningful programs."—MUSE

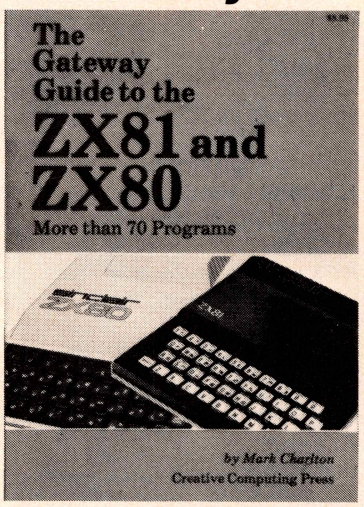
5½" x 8", 132 pages. #17P $8.95 ($2.00)



Getting Acquainted With Your ZX81
by Tim Hartnell

This informative volume for the new ZX81 user contains more than 70 programs to help the reader get the most from his Sinclair computer. Game programs include Checkers, Alien Imploders, Blastermind, Moon Lander, Breakout, Star Burst and Derby Day. The book also shows programs for cascading sine waves, plotting graphs and tables, data sorting, equation solving, plus the use of PLOT, SCROLL, PRINT, TAB, PEEK, POKE and much more!

5½" x 8", 120 pages. #15Y $8.95 ($2.00)



The Gateway Guide to the ZX81 and ZX80
by Mark Charlton

The Gateway Guide is a practical programming manual for the beginner that furnishes over 70 fully documented programs. The majority of the programs have been written for easy conversion from machine to machine (ZX81, 4K ZX80 or 1K ZX80). *The Gateway Guide* describes each function and statement, illustrates it with a demonstration routine or program, and combines it with previously discussed material to help you understand your computer.

5½" x 8", 172 pages. #160 $8.95 ($2.00)

Computers for Kids (Sinclair Edition) by Sally Larsen

This new edition of *Computers for Kids* is written specifically to introduce children aged 8 to 13 to the ZX81. The book requires no previous knowledge of algebra, variables or computers, and it enables a youngster to program a ZX81 in less than an hour. There's also a section for parents and teachers. "*Computers for Kids* is the best material available for introducing students to their new computer."

—Donald T. Piele, Professor of Mathematics, University of Wisconsin-Parkside.

8½" x 11", 56 pages. #12S $3.95 ($1.00)

All volumes are softbound.

Creative Computing Press, Dept.Z020, 39 East Hanover Ave., Morris Plains, NJ 07950

Please send books listed below:

Item No.	Qty.	Price each	(P&H)	Total Price

Postage and handling charges appear in parentheses ( ) next to price of book.

Outside U.S.A. add $3.00 per order—shipped air mail only.

☐ Enclosed is $_____ . NJ residents add 5% sales tax.
☐ Charge my (Charge and Phone Order $10 minimum):
☐ American Express ☐ MasterCard ☐ Visa

Card Number_____ Exp. Date_____

Signature_____

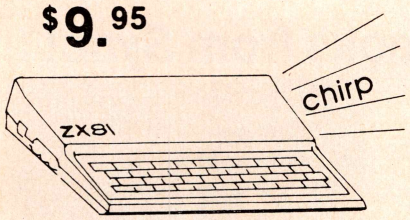
Mr./Mrs./Ms._____
(please print full name)

Address_____

City/State/Zip_____

CHARGE ORDERS—For Your Convenience PHONE
TOLL FREE 800-631-8112, In N.J. Only (201) 540-0445.

$9.95



CHIRPER module for your ZX81

The CHIRPER module lets you enter keyboard data fast and accurately. A sound can be heard when a key has been entered enabling you to spot a double entry or missed entry without looking up at the screen.

The CHIRPER sound is produced when a program runs. A key entry results in a buzz-like chirp on 1K or 2K machines. Large programs in a RAM pack produce a continuous sound that chances pattern on key entry.

The CHIRPER module installs easily inside the ZX81 case with only 3 wires to connect. Complete installation instructions included.

To order your CHIRPER send a check or money order. We pay the postage in the U.S.A., elsewhere include first class postage for three ounces.

AUDIOGRAPH CO.
3584 Leroy, Ann Arbor, MI 48103

ZX81 Keyboard Audio Tone

Audio Keystroke and Program Monitor

* TWO TONE. One to indicate initial press of key, the second tells you when computer is ready to accept next entry (very useful when entering long program listing)
* Indicates start and finish of running programs, and start and end of SAVE and LOAD routines
* Indicates Keyboard entry during INPUT prompts
* Use to indicate progress of running programs, or for sound effects in games programs, by including short PAUSE in listing.
* Operates in FAST and SLOW modes, with normal or shifted keys
* Only five simple connections to ZX81 P.C.B.

Supplied ASSEMBLED complete with fitting instructions

$18.00 ASSEMBLED. Includes postage/shipping.

Cheques and money orders payable to:

TV SERVICES OF CAMBRIDGE LTD
CHESTERTON MILL
FRENCH'S ROAD
CAMBRIDGE CB4 3NP
ENGLAND.
Tel: (0223) 358366

8K ROM; 2K RAM
4K ROM; 1K RAM

Elimination

A. Dan Klyver

Elimination is a traditional dice game which provides a worthwhile vehicle for teaching young children (and others) simple strategy, an understanding of odds, and the mental manipulation of numbers. Consequently, it helps reinforce arithmetic skills since the player's ability to use mental arithmetic is pitted against the computer's problem posing ability. Although the game is fun to play alone, a group can play by each taking a turn and keeping score to see who can do the best job of eliminating numbers.

Enter the program in Listing 1 and hit NEWLINE. The numbers 1 to 9 will appear together with the randomly produced results of a dice roll. You are prompted to make a choice(s) of which number or numbers you wish to eliminate in the range of 1 to 9. See Figure 1. The total of the numbers selected for elimination must equal the total of the dice role. For example, if on the first roll of the game, you roll a 5 and a 4, you may eliminate a 9 or any combination of numbers totaling 9.

The object of the game is to eliminate all of the numbers. The selection of a given number or combination of numbers is up to the player, but the odds of rolling any particular number should be considered when making the selection.

After making the selection, hit NEWLINE. The selected numbers will become zero(s). This will indicate that they have been eliminated and cannot be played again. The results of a new dice roll will also be displayed. The game proceeds with the next selection.

Improper entries will result in early termination of the game (a penalty for making a mistake). When the game is approaching the end, a roll that is not compatible with the remaining numbers will terminate the game with the total of the remaining numbers being displayed as the score. The lowest number wins.

To play again, hit NEWLINE. To revert to the program listing, enter four letters and hit NEWLINE. After a "win" is scored (all numbers eliminated), the program will be listed again.

A. Dan Klyver, 29 Old Stagecoach Rd., Weston, CT 06883.

4K ROM Version

The program listing is for the 8K ROM, but it can be adapted to the 4K ROM by making the following changes:

```
110 RANDOMISE
120 LET X=RND(6)
140 LET Y=RND(6)
180 PRINT "ENTER YOUR CHOICE(S)
 ONE AT A   TIME EACH FOLLOWED B
Y ENTER"
200 IF NOT B(Q)=Q THEN GOTO 270
220 IF NOT B(R)=R THEN GOTO 270
240 IF NOT S=B(S) THEN GOTO 270
250 IF NOT T=B(T) THEN GOTO 270
330 PRINT "GAME OVER, TO REPLAY
HIT ENTER"
450 IF NOT B(A)=0 THEN GOTO 50
```

Listing 1. Elimination (8K ROM).

```
 10 DIM B(9)
 20 FOR A=1 TO 9
 30 LET B(A)=A
 40 NEXT A
 50 PRINT "THE NUMBERS TO BE EL
IMINATED ARE"
 60 PRINT
 70 FOR A=1 TO 9
 80 PRINT B(A);" ";
 90 NEXT A
100 PRINT
110 RAND
120 LET X=INT (RND*6)+1
130 PRINT
140 LET Y=INT (RND*6)+1
150 LET Z=X+Y
160 PRINT "YOU ROLLED A ";X;" A
ND A  ";Y
170 PRINT
180 PRINT "ENTER YOUR CHOICE(S)
 ONE AT A   TIME EACH FOLLOWED B
Y N/L"
190 INPUT Q
200 IF B(Q)<>Q THEN GOTO 270
205 IF Q=Z THEN GOTO 420
210 INPUT R
220 IF B(R)<>R THEN GOTO 270
225 IF R+Q=Z THEN GOTO 410
230 INPUT S
240 IF S<>B(S) THEN GOTO 270
245 IF Q+R+S=Z THEN GOTO 400
250 INPUT T
260 IF T<>B(T) THEN GOTO 270
265 IF Q+R+S+T=Z THEN GOTO 390
270 PRINT
280 LET V=0
290 PRINT
300 FOR P=1 TO 9
310 LET V=V+B(P)
320 NEXT P
330 PRINT "GAME OVER, TO REPLAY
HIT N/L"
340 PRINT
350 PRINT "SCORE=";V
360 INPUT G$
370 CLS
380 GOTO 10
390 LET B(T)=0
400 LET B(S)=0
410 LET B(R)=0
420 LET B(Q)=0
430 CLS
440 FOR A=1 TO 9
450 IF B(A)<>0 THEN GOTO 50
460 NEXT A
470 PRINT "YOU WIN"
```

Figure 1. Sample Run.

```
THE NUMBERS TO BE ELIMINATED ARE
0 0 0 0 0 0 0 8 0
YOU ROLLED A 1 AND A  1
ENTER YOUR CHOICE(S) ONE AT A
TIME EACH FOLLOWED BY N/L

GAME OVER, TO REPLAY HIT N/L
SCORE=8
```

Arithmetic with a Smile

George J. Repicky

The computer as an instructional tool is perhaps nowhere more successful than in conducting arithmetic practice drills. Unlike the typical classroom teacher, the computer never tires and never makes a mistake. It provides arithmetic practice and never forgets to reward a right answer with a smile.

Addition

Enter the program in Listing 1 and then RUN it. This is the basic program. It will generate an addition problem and print it in the upper left hand corner of the screen. The computer then awaits the user's answer. If the answer is correct, the complete problem with the correct answer is displayed, and the user is rewarded with a smile. After a five second pause a new problem is displayed. If the answer is wrong, the problem is again displayed along with the incorrect answer. The user is again asked the question while a frown is displayed. Entering a letter instead of a number will stop the program.

Listing 1. Addition Practice.

```
 110 RAND
 120 CLS
 130 LET X=INT (RND*10)
 140 LET Y=INT (RND*10)
 150 PRINT
 160 PRINT X;" + ";Y;" = ?"
 170 INPUT Z
 180 CLS
 190 PRINT
 200 PRINT X;" + ";Y;" = ";Z
 210 FOR N=1 TO 20
 220 PLOT 10+SIN (N*PI/10)+31,10
*COS (N*PI/10)+22
 230 NEXT N
 240 PLOT 26,26
 250 PLOT 36,26
 260 PLOT 31,22
 270 PLOT 31,17
 280 PLOT 30,17
 290 PLOT 32,17
 300 IF Z<>X+Y THEN GOTO 350
 310 PLOT 29,18
 320 PLOT 33,18
 330 PAUSE 250
 340 GOTO 120
 350 PLOT 29,16
 360 PLOT 33,16
 370 PRINT
 380 GOTO 160
```

George J. Repicky, 49 Roosevelt Ave., Schenectady, NY 12304.

Other Arithmetic Operations

The other arithmetic operations can be done with the following modifications to the program in Listing 1:

Subtraction

140 LET Y=INT(RND*X)
160, 200, 300: Change + to -.

Multiplication

160, 200, 300: Change + to *.

Division

130 LET Y=INT(RND*9)+1
140 LET X=INT(RND*10)*Y
160, 200, 300: Change + to /.

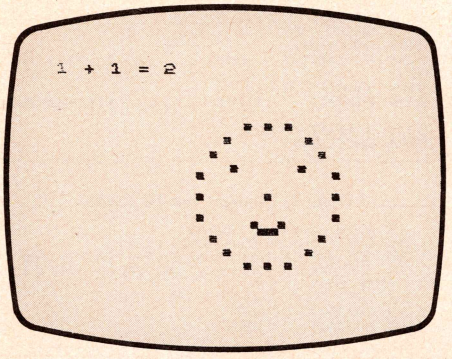
For those who do not need a smile or frown to make the drill more lively, the lines generating the face can be omitted.

Notes

Addition

110: Sets the seed of the random number generator.

130: Sets the range of numbers the random number generator can choose from for one number of the drill problem. To increase the range, increase the number in parentheses. This will give more difficult problems, but a bit more memory may be necessary. If so, delete Lines 150 and 190.



140: Does the same for the other number of the problem.

160: Presents the problem.

170: Inputs the user's answer.

200: Presents problem with user's answer.

210-230: Draw face outline.

240-260: Draw eyes and nose.

270-290: Draw part of mouth.

300: Branches to reprint problem and frown for wrong answer.

310-320: Complete the smile.

330: Generates 5 second pause.

340: Goes back to present next problem.

350-360: Complete the frown.

380: Returns to input the user's next answer.

Subtraction

140: Provides a problem with a non-negative number.

Division

130, 140: Assure that the dividend is evenly divisible. ■

Listing 2. Addition Practice (4K ROM)

```
 110 RANDOMISE
 120 CLS
 130 LET X=RND(10)-1
 140 LET Y=RND(10)-1
 150 PRINT
 160 PRINT X;"#+#";Y;"#=#?"
 170 INPUT Z
 180 CLS
 190 PRINT
 200 PRINT X;"#+#";Y;"#=#";Z
 210 PRINT
 220 PRINT
 230 PRINT ,"###F#DF"
 240 PRINT ,"##E#####E"
 250 PRINT ,"#E########E"
 260 PRINT ,"D#R####R##D"
 270 PRINT
 280 PRINT ,"E####E####E"
 290 PRINT ,"D","##D"
 300 PRINT ,"####";
 310 IF NOT Z=X+Y THEN GO TO 340
 320 PRINT CHR$(136);"WE"
 330 GO TO 370
 340 PRINT "FW"
 350 PRINT ,"#E##E#E##E"
 360 REM
 370 PRINT ,"#E","#E"
 380 PRINT ,"##EF#DF#E"
 390 PRINT
 400 IF NOT Z=X+Y THEN GO TO 160.
 410 INPUT I$
 420 RUN
%
```

Subtraction

```
140 LET Y=RND(X+1)-1
160, 200, 310, 400:
  Change the + to -
```

Multiplication

```
160, 200, 310, 400:
  Change the + to *
```

Division

```
130 LET Y=RND(9)
140 LET X=(RND(10)-1)*Y
160, 200, 310, 400:
  Change the + to /
```

2 AMP POWER SUPPLY

FOR ZX80/81/MICROACE

As you expand your system you'll need more power to run it. This supply has it!

2 Amp Power Supply $19.95
Plus $2.50 Shipping/Handling
Illinois residents add 6%

POWER LINE FILTER

Protect your system from power line R.F. interference and transients that can cause unnecessary program crashes.

5 Amp Filter Kit $23.95
Assembled & Tested $29.95
Plus $2.50 Shipping/Handling
Illinois residents add 6%

MAIL CHECK OR MONEY ORDER TO:
HURRICANE ELECTRONICS
P.O. Box 87 • Dolton, IL 60419

PUT YOUR TIMEX/SINCLAIR COMPUTER TO WORK!

TIMEX/SINCLAIR SOURCEBOOK
- SOFTWARE
- HARDWARE ADD-ONS
- BOOKS/CATALOGS

Maximize your ZX80, ZX81 or TS1000 computer investment with the TIMEX/SINCLAIR SOURCEBOOK which lists programs, hardware accessories and reference books.

The SOURCEBOOK allows you to quickly identify the ZX computer products you need from a wide variety of sources to put your computer to work. Order your copy today — only $4.95.

TIMEX/SINCLAIR SOURCEBOOK
Micro Design Concepts
Dept. SC-5
P.O. Box 280
Carrollton, TX 75006

Please send me the TIMEX/SINCLAIR SOURCEBOOK. I enclose $4.95 plus $1.25 P&H ($2.50 outside the U.S.) Add sales tax in TX.

Name _____

Address _____

City _____

State/Zip _____

Have a product you would like listed?

☐ Check for an application for free listings.

8K ROM; 2K RAM
4K ROM; 1K RAM

Arithmetic Series Quiz

Richard Van Workum

One exercise to sharpen arithmetic skills is to use a series of numbers which require discerning the relationships of the numbers in order to complete the series. The program in Listing 1 will print out an arithmetic series. Your task is to figure out the next two numbers in the series. If you are not successful in two tries, the answer is given.

Line 1 stores the data to construct each series. Memory is saved by using the alphabet for storing two digit numbers in the same way that the hexadecimal system uses A to F for representing 10 to 16 in the decimal system. Data is stored in blocks starting with Z which is used as a flag to tell the computer where each block begins.

Line 30 randomizes which block of data is to be used. The computer then searches for the beginning of the block in line 35. A constant is added to the series to make the program more challenging. The end of each block is flagged by the Z of the next block or by 118 (NEWLINE) which is the end of the REM statement. The series is printed on the screen except for the last two numbers which the player has to figure out.

The program is packed tightly in 1K RAM on the ZX80 and requires over 1K RAM on the ZX81. Memory is saved by using keyboard commands in lines 170, 600, and 610. In this way the program provides the maximum variety of series in the small memory.

To exit the program, key in a unused variable letter when asked for a number, or key in a character when "N/L FOR NEW SERIES" is printed.

Enter the program in Listing 1. If you have the 4K ROM make the changes in Listing 2 as you enter the program. Hit RUN and ENTER, and stretch your arithmetic perceptions. ■

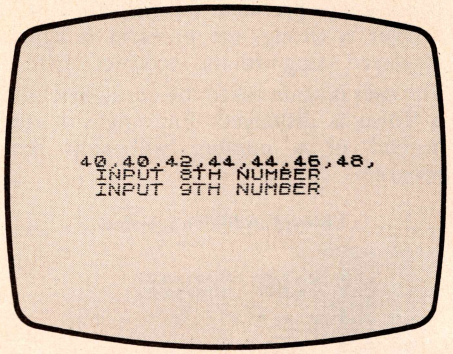
Richard Van Workum, 920 Leslie Ln., Hanford, CA 93230. Program translated to 8K ROM by James Grosjean.

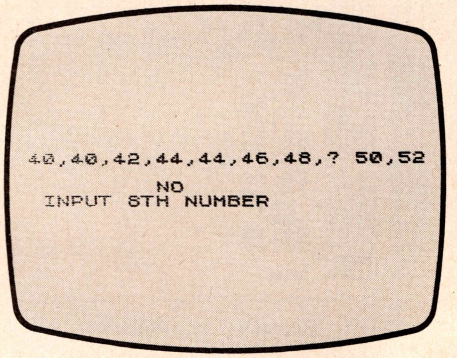
Listing 1. Arithmetic Series Quiz Program (8K ROM).

```
   1 REM Z01923845 7Z807162534Z04
8159 26AZ3074B6FCJZ4053667 98Z0541
5627 8Z420642864Z02B35B68BZ042645
6A8Z0857ACFHKZ1L3N5P7R9ZA9865421
0Z0235689BCEZCB9865320Z00244688A
Z0516273847320542764Z02441355246
6ZAGF8ED5CB1A9
  14 DIM V(12)
  15 DIM G(2)
  20 LET R=INT (RND*100)+1
  22 LET K=0
  25 LET L=0
  30 LET M=16513+INT (RND*197)+1
  35 IF PEEK M=63 THEN GOTO 50
  40 LET M=M-1
  45 GOTO 35
  50 LET M=M+1
  55 IF PEEK M=63 OR PEEK M=118
THEN GOTO 95
  70 LET L=L+1
  75 LET V(L)=PEEK M-28+R
  80 GOTO 50
  95 GOSUB 500
 110 PRINT
 115 GOSUB 600
 120 IF G(1)=V(L-1) AND G(2)=V(L
) THEN GOTO 150
 125 GOSUB 500
 130 PRINT "? ";G(1);",";G(2)
 132 PRINT
 133 PRINT TAB 8;"NO"
 134 IF K=1 THEN PRINT V(L-1);",
";V(L)
 135 IF K=1 THEN GOTO 170
 136 LET K=1
 140 GOSUB 600
 145 GOTO 120
 150 GOSUB 500
 155 PRINT G(1);",";G(2)
 160 PRINT
 165 PRINT TAB 8;"YES"
 170 PRINT "N/L FOR NEW SERIES"
 175 INPUT A$
 180 IF A$="" THEN GOTO 20
 185 STOP
 500 CLS
 505 FOR I=1 TO L-2
 510 PRINT V(I);",";
 515 NEXT I
 520 RETURN
 600 PRINT "  INPUT ";L-1;"TH NU
MBER"
 605 INPUT G(1)
 610 PRINT " INPUT ";L;"TH NUMBE
R"
 615 INPUT G(2)
 620 RETURN
```

Listing 2. Changes for 4K ROM.

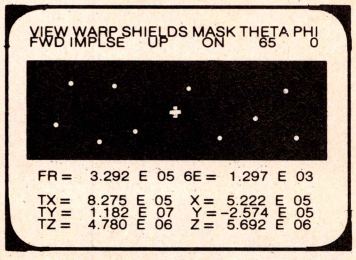
```
  20 LET R=RND(100)
  30 LET M=16426+RND(197)
  35 IF PEEK(M)=63 THEN GOTO 50
  55 IF PEEK(M)=63 OR PEEK(M)=11
8 THEN GOTO 95
  75 LET V(L)=PEEK(M)-28+R
 133 PRINT ;"NO"
 165 PRINT ;"YES"
```





-81 SPACE RAIDERS™

ZX81



16K RAM

The Federation has declared a state of all-out war, leaving you in charge of the Starship Defiant: newest and most advanced spacecraft known to man.

Soon, your experienced guidance will bring you within range of the Klingon convoy. Hundreds of stars flash by as you check the status of your Phasors, Shields, Masking, Navigation, Scanning, and Computation Equipment. The energy drain is tremendous, as the target distance indicator ticks slowly downward...

As you come into range you set your cross-hairs on the nearest ship. Fire Phasors!!! Switch to Aft view!!! Evasive Maneuvers!!! Space explodes all around you as the first Klingon ship disintegrates and the remainder lock onto your position...

High speed graphics and custom ML math package provide the real time, accurate simulation of the above space navigation and battle scenario. You've never seen this kind of performance on your ZX81 before!

Only $19.95 for cassette, keyboard overlay, and manual (shipping included). (Utah residents add $.95 tax)

NIRAD ELECTRONICS

959 East 460 South
Provo, UT 84601

ZX81 PERSONAL BANKING SYSTEM WITH LOAD/SAVE DATAFILES AT DOUBLE SPEED

Load the program in the normal way—enter, amend or delete your transactions (ZX81 will automatically scan standing order file and post any items due)—save the file of data onto cassette in 45 seconds—load a different datafile into the same program, also in 45 seconds—enter items, etc.—save datafile only onto cassette (45 seconds)—repeat operation for any number of accounts.

Absolutely no need to save *program*, as all information is held in datafiles. Very easy to use—unlike other bank accounts. Requires a minimum of 16K RAM—can use much more (no modification required).

On Demonstration at the next ZX Micro Fair.

The personal Banking System also includes the following features—

- Full page detailed Bank Account, dual display (or printout).
- Automatic generation of standing orders on due dates.
- Validation of all entries.
- Correct any item previously entered. (Single/Multiple field correction)
- Enter an item (previously omitted) in the correct date order of the account.
- Single key operation. Utilises a M/C keyboard scan.
- Search for any item or items by cheque number, description or amount—display (and printout if required) with totals.
- Continuous display of statement extract, continually updated during input of entry.
- File of standing order details can be displayed, printed, added to, cancelled and amended.
- Detailed User Manual.
- After sales maintenance.

Send £9.95 ($20) incl. for cassette and users manual to J.P. Gibbons A.I.B., 14 Avalon Road, Orpington, Kent, BR6 9AX, England. (Send large S.A.E. for details).

There are only two suppliers of supported ZX81 software, this is one of them. Be sure to include your name and address.

Coming soon: Bank Reconciliation Module—a separate program on cassette that utilises data supplied by the main program (S.A.E. for full details).

The only expandable system for the ZX81.

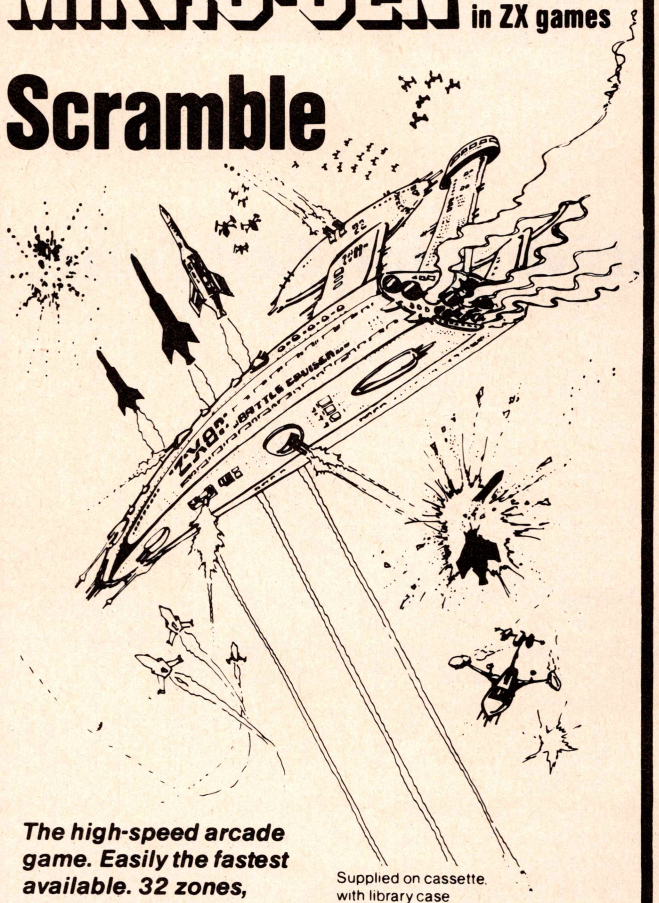
The Personal Banking System is also available from the Buffer Shop, Streatham, London and Branches of the Computer Bookshop Group, full maintenance still available.

from

MIKRO-GEN

the leaders in ZX games

Scramble



The high-speed arcade game. Easily the fastest available. 32 zones, thrust and altitude controls.

Supplied on cassette. with library case

ONLY $7.95

Other great ZX games and add-ons from Mikro-Gen:

Space Invaders
the best you can get, with ever-increasing rate of play

Breakout
with seven bat angles to make it really difficult

Bomber
positively addictive

ZX Chess
The original – and still the best!

Sorcerer's Castle
takes you into a world of magical adventure

Above games all supplied on cassette. with library case

$7.95 each (ZX Chess $12.95)

A/D Converter Board
Lets you connect analogue joysticks to the ZX81 digital inputs. Suitable for many other applications, easy to connect – and it improves RAM pack stability!

ONLY $36.95

Joysticks
Connect via our A/D Board – makes your ZX81 a true programmable games machine

ONLY $18.95 EACH

Disassembler/Monitor
An absolute must when learning machine code – lets you enter and run your own code

ONLY $7.95

Write for full details of the Mikro-Gen range of programs and add-ons, available from local stockists or direct from the manufacturers (please make cheques/PO's payable to Mikro-Gen and add $1.90 postage for software, $3.50 for hardware

Suppliers of Software to Sinclair

MIKRO-GEN

24 Agar Crescent Bracknell Berks RG12 2BK
Tel: Bracknell (0344) 27317

8K ROM
1K RAM

Solving Implicit Functions on the ZX81

Basil Wentworth

Solving arithmetic and algebraic problems on the ZX81 is easy when the variable wanted is defined explicitly, that is, if you know that Y = X ** 2 + 2 * X, it is easy to program:

```
10 INPUT X
20 LET Y=X**2+2*X
30 PRINT Y
```

Now you put in the values of X and let the computer find the corresponding values of Y.

The fun begins when the variable you want is defined as an *implicit function*. Suppose, for instance, you have a value of Y for the above equation and you want to find the corresponding value of X. As a practical example, let us define a rectangle with an area of 15 square feet subject to the constraint that the length will be two feet greater than the width. This would give you the exact equation shown above, i.e., 15 = X * (X + 2) or 15 = X ** 2 + 2 * X.

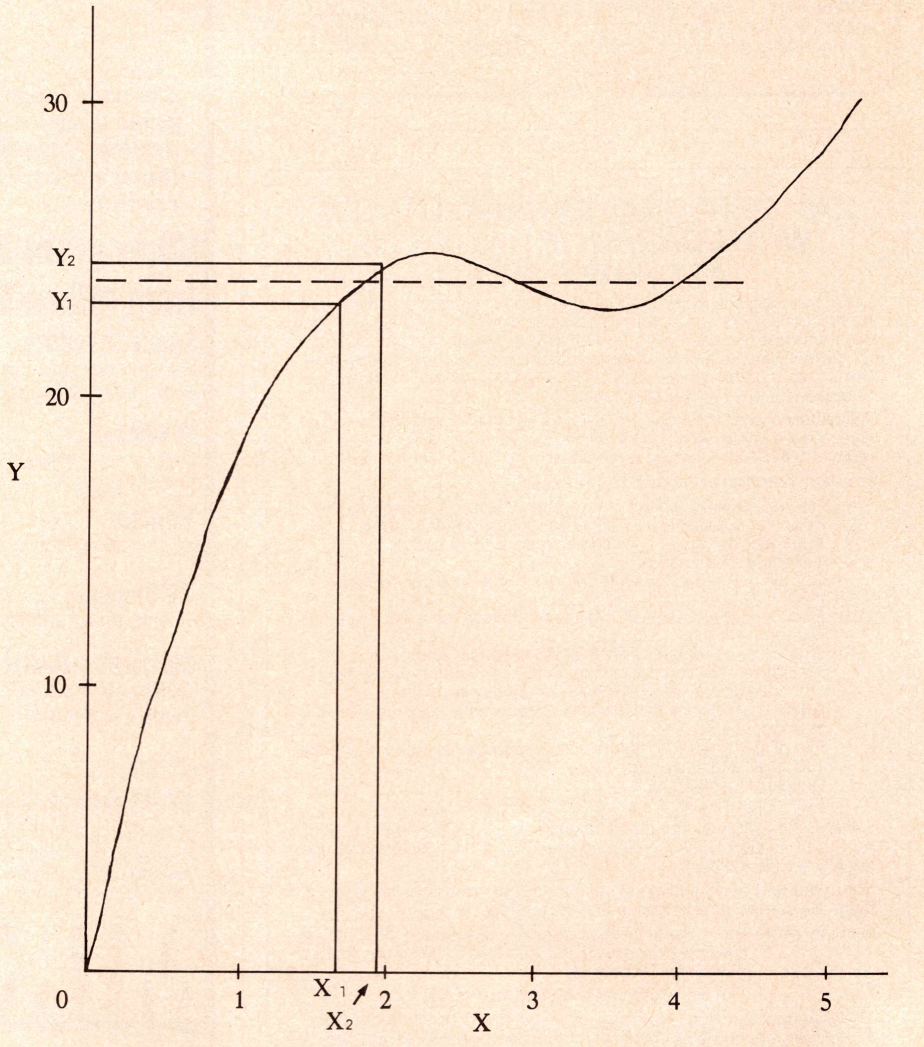
This is a little hard to program. Just try telling your computer to LET 15 = X ** 2 + 2 * X.

In your high school algebra class you learned some fairly easy ways to solve a quadratic equation and that is what we have here—if you remember them. But what is the use of having a computer if you are going to solve the problem by the old horse-work techniques? Or, suppose, you get something a bit more complicated like Y = X ** 3 + 3 * X ** 2 + 4 * X. Or, perhaps, Y = X * SIN X. Or, Y = (e ** X) * SIN X. It is a little harder to solve these.

The computer can handle problems of this kind by making a series of successive approximations: try out any value of X, and see if it gives the Y you want; if it does not, then try another value of X.

This is the sort of thing that a computer does beautifully, but you will want to give it a little guidance. If you keep pulling X's out of the hat, you may never hit on the right one; in fact, you may not even know how close you are to being right. So you want to find a systematic way of zeroing in on the right value of X.

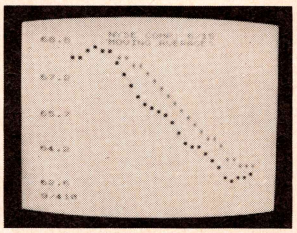
Figure 1. Graph of Y=X3-9*X**2+26*X**



Basil Wentworth, 1413 Elliston Dr. Bloomington, IN 47401.

STOCK MARKET PRICE ANALYSIS

HELP! for the Small Investor



Now SINCLAIR ZX-81 (16K) owners can do what the professional market traders do — use a computer to predict *price direction*. This program tracks up to six stocks, averages, or commodities, and produces *graphs* and uses technical indicators to help you make trades.

Technical analysis is based on two ideas: first, that the market, like the rest of human behavior, repeats itself; and second, that there are professionals and insiders who know what the market is going to do before everyone else does, and who place trades in a way that is hardly noticeable. TECHNICAL ANALYSIS attempts to read the price action and volume figures to determine whether predicable patterns are developing, and what the professionals are doing.

Professional traders have been using computers to make this kind of analysis for years, because the manipulation of the data is very complicated and time-consuming. With this program, you let the computer do the work, and its signals become a powerful investment tool.

The program makes *GRAPHS* of the daily prices, of two moving averages, and of a volume indicator. A booklet that comes with the program helps you learn what to look for.

The program does an *ANALYSIS* to signal trend-formation and turn-arounds. It gives a score for each indicator, and a total score, to help you see whether there is confirmation among the signals.

USE THIS TO TRADE STOCKS, OPTIONS, AND THE NEW STOCK INDEX FUTURES!!

This gives POWER TO THE SMALL INVESTOR!

For program tape and booklet send $30.00 to:

NOOTER STOCK PROGRAM
320 East 25th Street
New York, N.Y. 10010

(N.Y. residents, add $2.48 sales tax.)

THE BEST VALUE NEXT TO YOUR COMPUTER IS SUPPORTED SOFTWARE ON CASSETTE

ZX81 MX-PAC TS1000

18 useful/fun programs on CASSETTE make the small memory act like much more-for the whole family..games.. files..lists..SUPER draw-on-tv,security codes..3-D motion and growth simulations..bar graphs..financial helpers(loans,tax)+more+all BASIC ..all explained in Printout 1..

and

1 extraordinary BOOK, Printout 1 shows how the 18 work and GROW and GROW..many ideas..even more line-numbered add-ons for 2K and 16K power-multilevel files,lists,games.. a keyboard "light-pen" that makes draw-on-tv a powerful designing tool-menu-driven programs-financ'l planner ..a complete recipe file (16K)..step by-step build a checking account(16K) -"unbreakable" codes and a challenge THE GREATEST RANGE AND DEPTH OF ANY SOFTWARE is only $24.95..Act today! Send check or MO to ROBILL PRODUCTS 555 PARK AVE.,PATERSON,NJ 07504 ALL ORDERS processed fifo. Please add $2.75 p/h (1st class)NJ res.add 5%

ZKi

EDUCATION ENTERTAINMENT
Personal Management
16K Software On Cassette

ZK-PARTY GAMES $9.95
Five Games for Hours of Party Fun.
Includes Charades (500 topics), Password (500 words), Improv-Skits, Gossip, and "Radio DJ".

PARTY GAMES FOR CONSENTING ADULTS $14.95
Contains five games designed to entertain a gathering of close friends. Strip/Trivia, pits your knoweldge of trivia against your clothes. In "Body Twister" the computer tells players where to place their hands, feet, etc. on other players. Three others. Write for information.

ZK FOOTBALL $12.95
This textual version of football features 12 off. players, 8 defenses, solitaire or dual plays, auto time keeping, individually designed teams, and full team stats (including printer output). Plastic keyboard overlay.

ZK BASKETBALL RELAYS (AVAILABLE NOV. 1.)
Teams include 8 individually rated players who shoot, rebound and defend as in real life. Solitaire or two players, 1981/82 Pro (23 teams) or College Top 25. **$19.95** each.

PRIMARY ASSOCIATION $9.95
A good way to introduce your three-six year old to computers, while reinforcing school work. Provides drills for matching, association, and basic comprehension.

ARITHMETIC BASEBALL $9.95
An entertaining educational program where children and adults compete evenly while learning. Questions range from simple counting to trig. Correct answers result in hits according to relative difficulty.

HOME MANAGER $12.95
This menu driven program stores info on 50 families (enough for most) on each cassette. Names, address, phone, and four lines of miscellaneous data (up to 8 important dates). Sort on names or dates. Also includes printer output for address labels or complete files.

WE OFFER A COMPELTE LINE FOR EDUCATIONAL, GAME, HOME AND PERSONAL MANAGEMENT PROGRAMS FOR THE ZX81 AND TIMEX 1000.

CATALOG $1.00 CREDITED TOWARD FIRST ORDER.

ZOR KHAN INDUSTRIES
BOX 31567
Aurora, Colorado 80041

Full replacement warranty on all tapes. Add $1.00 postage and handling. Colorado residents add 6.5% tax. Send check, money order, or VISA-MASTER CARD Acct. #, Exp. Date, and Signature. No C.O.D. Please.

Z-Ware Sale
ZX81/TS-1000 Software on Cassette
$8.95 each ppd.
16K Histogram—plots bar chart
16K Financial Manager—for home or business
16K Machine Intelligence Demo—life forms that actually learn.
Many more available—send self-addressed, stamped envelope.
Z-Ware
Box 111
Albany, Kentucky 42602
1-606-387-8391

WARP IO
A graphics space game, for the ZX81 with ten different skill levels requiring 16K. Only $9.95. Send $9.95 plus $1.50 for postage to:
SOFT CLAIR
Two Enchanted Oaks
Orange, Texas 77630

STATS IN A FLASH
Sinclair COMPU-STAT 8K/16K. Menu-driven program with user's manual does common descriptive stats plus student's *t*, Mann-Whitney *U*, Simple ANOVA. Automatic freq. dist. graphing. Also ZX-printer output. SAVEs & LOADs data on tape. $9.95 for cassette and user's manual from: **COMPUTERCRAFT** 156 Drakes Lane, Summertown, TN 38483

Sinclair Computer Family
SOURCE BOOK
Find out what your Sinclair Computer can do!
Contains over 600 programs, books and accessories for the:
TS-1000 • ZX-81
ZX-80 • Micro-Ace
Send $6.95
plus $1.25 postage/handling.
Atlantic Computer Products
Post Office Box 936
Norfolk, Virginia 23501

Linear Interpolation

The method for doing this is called Linear Interpolation. Look at Figure 1 for a moment. Suppose that the solid curve shows the relationship between X and Y and that the dotted line indicates the value of Y that you are interested in. The value of X that yields this Y is found, of course, right beneath the point at which the dotted line hits the curve—somewhere between X1 and X2.

So select X1 and X2 as first approximations, find what values of Y1 and Y2 they correspond to, and then go for another estimated value of X according to what Y1 and Y2 tell you. The adjustment in X will not be strictly proportional to the error in Y unless the curve is a straight line in this region, but a proportional correction will still get you closer than you were, although on rare occasions you will come across a function that defies solution this way. Then use the new value of X as the approximate solution, and go through the process again, and again, if necessary, until you have reached the degree of accuracy you want.

Choosing your first X1 and X2 so that Y1 and Y2 surround the value is not usually imperative, but this can be helpful. In most cases, any two arbitrary approximations (as long as they are equal to each other) will suffice although some take longer to run than others.

Listing 1 contains the program to use. Type it in; press RUN and ENTER. The computer will ask you to enter the statement of the equation as Line 40. For example, the equation cited above would be entered as

```
40 LET Y=X**2+2*X
```

Then RUN 60 as the program instructs. The computer then tells you to enter a couple of guesses for X, as well as the target value for Y.

Then, as instructed, enter some tolerance figure to define the degree of accuracy that you want in the answer. Be realistic. If you ask for 0 tolerance, the computer will run all night seeking the impossible. If you specify 10% the computer will probably come a lot closer than 10%. If you call for .01%, the error seems usually to fall in the range of .001% or less. This is close enough for most practical purposes. In fact, you may want to "hard-write" (as an analogy with "hard-wire") a tolerance limit of .01% or .001% instead of entering it each time.

Listing 1. Implicit Functions (8K ROM).

```
  10 PRINT "ENTER "" 40 LET Y=F(
X)"""
  20 PRINT
  30 PRINT "THEN RUN 60"
  50 RETURN
  60 PRINT
  70 PRINT "ENTER Y"
  80 INPUT Y0
  90 CLS
 100 PRINT
 110 PRINT "ENTER FIRST APPROXIM
ATION TO X"
 120 INPUT X1
 130 CLS
 140 PRINT
 150 PRINT "ENTER SECOND APPROXI
MATION TO X"
 160 INPUT X2
 170 CLS
 180 PRINT
 190 PRINT "ENTER TOLERANCE IN P
ERCENT"
 200 INPUT T
 210 CLS
 220 PRINT
 230 LET X=X1
 240 GOSUB 40
 250 LET Y1=Y
 260 LET X=X2
 270 GOSUB 40
 280 LET Y2=Y
 290 LET X3=(X1-X2)*(Y0-Y2)/(Y1-
Y2)+X2
 300 LET X1=X2
 310 LET X2=X3
 320 IF ABS ((100*(X1-X2)/X1)>T T
HEN GOTO 210
 330 PRINT "X = ";X2
```

Limitations

This technique has one limitation that may be serious in some instances. Many equations have two or more solutions, but this approach will give you only one of them. In the example given, the two solutions are: X = 3 and X = -5. In the practical cases, you are interested only in the positive values since it is rather difficult to lay off a length of -5 feet. And, if you started out with positive values for your approximations to X, the computer will give you the positive answer, but you run into trouble if more than one solution is realistic.

The curve shown in Figure 1, for example, represents the equation Y = X ** 3 - 9 * X ** 2 + 26 * X. If Y = 24, the equation has three positive roots: 2, 3, and 4. This routine will give one or another of them according to the approximate values chosen as the points of departure. If it were not for this factor, entering "hard-write" values for X1 and X2 in lines 120 and 150 would be tempting.

Another caution: do not make your first approximations too small. Above all, do not use zero. Even if you expect your answer to be zero, it is better to start with numbers like 1 or 2 to reduce the possibility of running into numbers too big for the computer to handle in line 260.

One other danger to watch out for is in the handling of negative numbers. Remember that the ZX81 is not able to raise negative numbers to powers. I suspect that this is so because the computer uses logarithms in the process, and the logarithm of a negative number baffles computer and human alike. If this danger appears to be imminent, it can be avoided by the following substitutions:

For even-numbered exponents, replace X ** n by (ABS X) ** n.

For odd-numbered exponents, replace X ** n by SGN X * (ABS X) ** n.

Remember that it is very, very likely that you will run into negative numbers when you use trigonometric functions. The same strategem will work with them.

For even-numbered exponents, use (ABS (SIN X)) ** n.

For odd-numbered exponents, use SGN (SIN X) * (ABS (SIN X)) ** n.

The program can be translated to the 4K ROM by making the following change:

```
10 PRINT "ENTER#";CHR$(212);"#40
LET Y=F(X)";CHR$(212)
```

However, the program will lose some of its appeal because of the lack of floating point arithmetic. The answers will be in whole numbers so the closeness of the approximations will be lost.

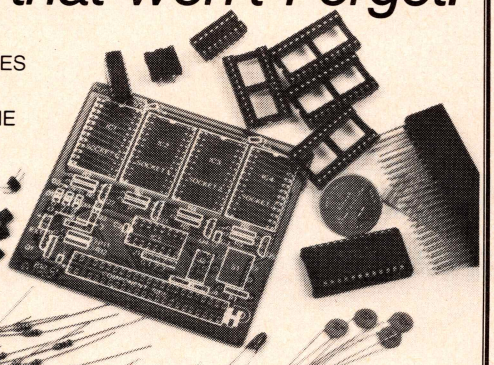
One final limitation is that this routine will not give imaginary roots, i.e., square roots of negative numbers, designated by mathematicians as i and by engineers as j. But you have little chance of running into these unless you are working with AC power or electronic circuits.

One final caution, remember that the ZX81 gives you the arguments of trigonometric functions in radians. If you want degrees, multiply the radian value by 180/PI. (*Ed. —See the article "Degrees, Grads, and Radians" elsewhere in this issue.*)

Extend your ZX81* System: Add Memory that won't Forget!

*or TIMEX 1000

- ADD YOUR OWN SYSTEM UTILITIES
- BUILD UP A LIBRARY OF MACHINE LANGUAGE SUBROUTINES
- UP TO 8K NONVOLATILE RAM
- USE HM6116P CMOS RAM OR 2716/2732 EPROM
- LOW POWER BACK-UP
- COMPATIBLE WITH 16K RAM PACKS



$29.95

This memory board is designed to fill the transparent 8K block of memory (from 8 to 16K) in a ZX81-16K system. The use of HM6116P 2K CMOS RAM memory IC's with their own reserve power supply means that routines stored in the RAM are nonvolatile — the RAM retains its memory even when the ZX81 is switched off or reset. Moreover, being RAM, the routines you store in the memory are easily modified.

With this board it's no longer necessary to place your machine language routines in REM statements, in string variables, or beyond RAMTOP. You can build up a resident library of machine utilities for use by your BASIC system.

Complete step-by-step instructions in a 14 page manual make assembly of the board easy. Construction takes between one and two hours. The kit (pictured above) is complete with a silkscreened solder-masked printed circuit board, all capacitors, resistors, transistors, sockets, connectors, integrated circuits, and the lithium cell. The board is supplied with one 2K CMOS 6116P-3 RAM — it will accomodate three more for a total of 8K.

Send check or money order for $29.95 plus $1.95 shipping and handling to the address below. The printed circuit board with the instruction manual is available separately for $15.00 post paid.

HUNTER, 1630 FOREST HILLS DRIVE, OKEMOS, MICHIGAN 48864

ZX80 ZX81 TIMEX MICROACE

CRASH NOT. WANT NOT.

Have you had unexplainable system crashes? Lost programs due to brownouts or power failures? Or just plain tripped over your electric cord?

If so, you need an uninterruptable power supply.

UPSYSTEMS is a battery powered backup system that kicks in **automatically** as soon as its sensors detect a drop in voltage coming from your power supply. Your system keeps on ticking.
Simple to install and use. Just plug your power cord into **UPS** and plug **UPS** into your system and you are ready for any power glitch or failure. (Additional cord included).

All systems include on/off/reset switch for your convenience (you no longer have to unplug your computer to reset it). All systems are compact, approx. 13 cm x 7 cm x 4 cm (5⅛" x 2⅝" x 1⅝").

UPS-1 Economy system, uses 2-9 volt alkaline batteries (not included). $14.95 + $2.00 shipping, handling & insurance.

UPS-1M Same as **UPS-1** except it includes a **P**rogram **L**oading **M**onitor to solve your tape loading problems. $19.95 + $2.00 S, H&I.

UPS-2 **NiCd** system that recharges itself automatically (NiCd batteries included). $29.95 + $3.00 S, H&I.

UPS-2M Same as **UPS-2** except it includes a **PLM**. $34.95 + $4.00 S, H&I.

90 Day Guarantee on Parts and Labor.

Check or money order payable to: **UPSYSTEMS**. Foreign orders add $1.00.

UPSYSTEMS
RA BANKS
5800 HOLLISTER
DEPT 1901
HOU TX 77040

ARTIFICIAL INTELLIGENCE FOR THE ZX81? *YES!*

SYNCZX is an artificial intelligence program with natural language capabilities for the ZX81 with 16K RAM, available from Frog Software.

SYNCZX will talk to you in ENGLISH/NO MENUS. You can use SYNCZX to balance your checkbook or you can reprogram SYNCZX to do anything you would like. However you do not need programming skills to use SYNCZX as is. Even a child can use SYNCZX because it is easy to read and understand, talking to you in simple English. SYNCZX even remembers the people who use it! 16K cassette with manual only $6.95 plus $1.50 postage & handling.

ALSO AVAILABLE
PERSONAL COMPUTING PACKAGE
7 programs. Graphs (1K), Appointment book (16K), Checkbook (16K) and Three Games (1K), etc . . . All 7 for only $1.95 plus .70¢ postage & handling.
Send to:

Frog Software
Box 95
Glenmont, New York 12077
(518) 465-6552

BOLEX: Beginner's Ohm's Law EXercises

Ray Stadta

Figure 1. Ohm's Law Variations.

I Amps	=	$\frac{E}{R}$	$\frac{P}{E}$	$\sqrt{\frac{P}{R}}$
E Volts	=	IR	$\sqrt{PR}$	$\frac{P}{I}$
R Ohms	=	$\frac{E}{I}$	$\frac{E^2}{P}$	$\frac{P}{I^2}$
P Watts	=	IE	I^2R	$\frac{E^2}{R}$

Ohm's Law

George Simon Ohm (1787-1854) was a German schoolmaster who studied the electric circuit and determined the relationship of voltage, the electromotive force (E); current, the intensity of electron flow (I); and resistance, the opposition to electron flow (R). The results of his experiments were expressed in the equation E=IR which can also be expressed as I=E/R and R=E/I.

To those outside the field of electricity, this equation, now called Ohm's law, may not seem very impressive, but it plays a very important role in the design and creation of such everyday wonders as electric lights, telephones, toasters, TVs, car starters, refrigerators, and computers. Before Ohm's work, unknown values of voltage, current, or resistance had been difficult, even impossible, to find experimentally. However, these unknown circuit values can now be found quickly and accurately by mathmatical computation from Ohm's equation. Despite this contribution of great importance to electrical science, Ohm lost his teaching job.

In addition to voltage, current, and resistance the electric circuit includes a fourth element: wattage, the measure of power consumption. Wattage is found by another equation: P=IE, in which P stands for watts. Thus, watts equal current times voltage. Notice that the power equation and Ohm's equations all have the terms I and E in common. Knowing how mathematics handles equations with common terms, we can see the expanded versions in Figure 1.

BOLEX

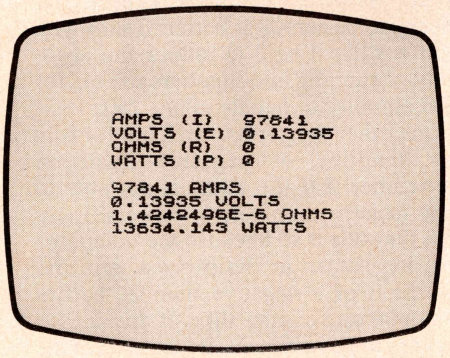
BOLEX is a program that solves these equations two at a time. Enter the program into your computer, hit RUN and NEWLINE. Four prompts will appear on your screen: amps, volts, ohms, and watts. Type in a value for one, hit NEWLINE. Continue until the values have been entered. With two values you will be able to find the other two. Try the following sample runs:

1) An appliance circuit has a current rating of 9 amps with 120 volts applied. What is the value of resistance in ohms and the power consumed in watts? Input: amps: 9; volts: 120; ohms: 0; watts: 0. The program finds the ohms and watts by solving the equations: R=E/I and P=IE.

2) How much current is drawn and how many watts are consumed by a 120 volt heating unit with 14 ohms resistance? Input: amps: 0; volts: 120; ohms: 14; watts: 0. The amps and watts are found by solving: I=E/R and P=IE or P=E*E/R where E is small enough not to cause an arithmetic overflow.

3) How much amperage and resistance is in the circuit of an appliance that uses 1625 watts plugged into 120 volts? Input: amps: 0; volts: 120; ohms:0; watts: 1625. The program solves: I=P/E and R=E*E/P.

4) A high-voltage circuit draws 5 amps with a known resistance of 450 ohms. Find the watts and volts. Input: amps: 5; volts: 0; ohms: 450; watts: 0. The program solves: E=IR and P=IE.



Machine Limitations

The 4K ROM has three limitations for the full use of the formulas. First, it functions only with whole number arithmetic. However, the program in Listing 2 includes routines for coaxing decimals from the ZX80 for the amps computation in the following lines:

210-240: division to one decimal place.

300-370: division to three decimal places.

430-440: multiplication of a 3-place decimal with accuracy near enough to 100% for the purposes of this program.

Second, the 4K ROM does not have the SQR function so again a routine is included to do this in lines 150-230. However, this gives roots only as whole numbers.

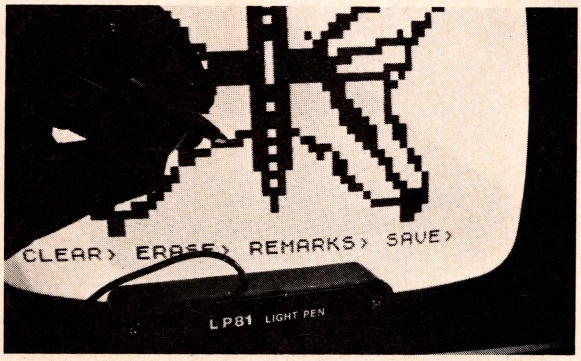
Third, in order to provide whole numbers the 4K ROM always rounds off the number by rounding down. This means that computations involving decimal places on the 4K ROM will not have the accuracy that the 8K ROM provides.

As you use this program to work out electric current problems, remember that the Sinclair is a beginner, too, and has a limited range. If you get carried away trying to figure how many watts are used to light up Yankee Stadium for a night game, be ready for an overflow error code (6).

By the way, six years after Ohm was fired, he got recognition and a better job at the University of Munich.

Ray Stadta, 120 Calle Cuervo, San Clemente, CA 92672. Translated to 8K ROM by James Grosjean.

LIGHT PEN UNDER $70



Light Pen for ZX81. Cassette included.	$69.95
Control Board for 8 devices	$49.95
Character Generator	$59.95
6K memory (Internal)	$49.95

mail to:

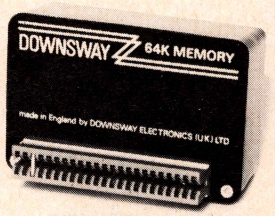
ZODEX

ZODEX east hill,
oakham, ma. 01068

DOWNSWAY

ELECTRONICS (UK) LTD

MORE MEMORY FOR THE ZX81/TIMEX 1000



16K—only $49.95 64K—just $119.95
Prices include shipping and handling

Downsway Electronics was one of the first manufacturers of add-on memories for the ZX81, and is a market leader in Britain and other countries.

The Downsway 64K Memory slots directly on to the computer, without needing an additional power supply or adding any extra load to the internal 5v regulator, and gives a further 56K of available memory.
". . . neat, small . . . fits very firmly . . . good value" ZX Computing *"fits perfectly with the style of the ZX81 . . . very well made . . . a very worthwhile addition to any ZX81".* Popular Computing Weekly.

The Downsway 16K RAM Pack is built to the same high standards of quality, performance and reliability for users who don't need a full 64K.

Both memories incorporate a top quality gold plated edge connector, and come complete with a special foam cushion strip for extra stability, plus comprehensive instructions and a full six-month warranty. Printer compatible, with "low profile" styling (both memories measure only 3 x 2 x 1 in).

DEALER/DISTRIBUTOR ENQUIRIES WELCOME

Send check or International Money Order to:

Downsway Electronics (UK) Ltd
Dept. S, Downsway House, Epsom Road,
Ashtead, Surrey, England

NAME .....

ADDRESS .....

CITY .....

STATE/ZIP S5

NEW

8K/16K

FROM HAY MARKET

ZX-BLACK BOX
ZX-CONCENTRATION

- Easy To Play
- Educational & Fun
- Playable By 1 or 2
- Cassette & Documentation
- Auto Run Features
- Playing Boards Displayed

Black Box $10.95
Concentration $8.95

#1.50 P&H Per Order

Florida Res. Add 5% Tax

HAYMARKET SOFTWARE CO.

• P.O. BOX 14026 • JACKSONVILLE, FLORIDA 32210

CYBORGWARS

NOT ANOTHER TOY

BUT A COMPLEX SIMULATION OF FOUR MILITARY-INDUSTRIAL ECONOMIES LOCKED IN A DEADLY STRUGGLE FOR SURVIVAL. ONE TO FOUR PLAYERS COMPETE WITH EACH OTHER AND/OR THE COMPUTER. BALANCE OF POWER DEPENDS UPON SKILL IN DEVELOPING RESOURCES, USE OF ESPIONAGE, EXPLOITATION OF ALLIANCES, AND UTILIZATION OF MILITARY POTENTIAL. REQUIRES ZX81 WITH 8K ROM AND 16K RAM.

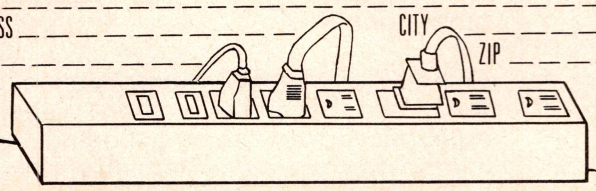
ORDER FORM FOR CYBORGWARS

Send $14 (plus $1 for shipping) to: STRATAGEM CYBERNETICS, INC., 286 Corbin Place, 2E, Brooklyn, New York 11235.

NAME _____

ADDRESS _____ CITY _____

STATE _____ ZIP _____



EXPANSION BOARD

Buffered Bus/Development Board for marketed and user built peripherals.

Offers significant yet inexpensive access to ZX81 hardware.

Improved Model:

Bare Board $40*
With connector to port and complete documentation.

Kit $65* Includes
6 connectors, 9 chips, sockets and other parts.
*Add $3 for ship & hndl.
Calif. res add 6% tax.
To order send check or M.O. to:

PROMPT DELIVERY.
HUNDREDS OF SATISFIED USERS.
Please send stamp for more info.

UHF MODULATOR $15
CLEANING TV DISPLAY

Computer Continuum
301 16 th Ave
San Francisco, CA 94118 (415) 752 6294

Figure 2. Ohm's Law Program (4K ROM).

```
 10 PRINT "AMPS (I)##";
 20 INPUT I
 30 PRINT I
 40 PRINT "VOLTS (E)#";
 50 INPUT E
 60 PRINT E
 70 PRINT "OHMS (R)##";
 80 INPUT R
 90 PRINT R
100 PRINT "WATTS (P)#";
110 INPUT P
120 PRINT P
130 PRINT
140 GO TO ABS(150*(I+E=0)+260*(
I+R=0)+350*(I+P=0)+450*(E+R=0)+4
80*(E+P=0)+510*(R+P=0))
150 LET H=182
160 LET L=0
170 LET E=(L+H)/2
180 LET K=(P*R)/E
190 IF K=E THEN GO TO 240
200 IF H-L<2 THEN GO TO 240
210 IF K<E THEN LET H=E
220 IF NOT K<E THEN LET L=E
230 GO TO 170
240 GO SUB 280
250 GO TO 540
260 GO SUB 280
270 GO TO 330
280 LET I=P/E
290 LET X=P-I*E
300 LET Y=10*X/E
310 PRINT I;".";Y;"#AMPS"
320 RETURN
330 LET R=E*E/P
340 GO TO 540
350 LET I=E/R
360 LET M1=E-I*R
370 LET D1=10*M1/R
380 LET M2=10*M1-D1*R
390 LET D2=10*M2/R
400 LET M3=10*M2-D2*R
410 LET D3=10*M3/R
420 PRINT I;".";D1;D2;D3;"#AMPS"
430 LET P=((D1*100+D2*10+D3)/10)
*E/100+I*E
440 GO TO 540
450 LET E=P/I
460 LET R=E/I
470 GO TO 530
480 LET E=I*R
490 LET P=I*E
500 GO TO 530
510 LET R=E/I
520 LET P=I*E
530 PRINT I;"#AMPS"
540 PRINT E;"#VOLTS"
550 PRINT R;"#OHMS"
560 PRINT P;"#WATTS"
```

Figure 3. Ohm's Law Program (8K ROM).

```
 10 PRINT "AMPS (I)   ";
 20 INPUT I
 30 PRINT I
 40 PRINT "VOLTS (E)  ";
 50 INPUT E
 60 PRINT E
 70 PRINT "OHMS (R)   ";
 80 INPUT R
 90 PRINT R
100 PRINT "WATTS (P) ";
110 INPUT P
120 PRINT P
130 PRINT
140 GOTO (150*(I+E=0)+180*(I+R=
0)+210*(I+P=0)+240*(E+R=0)+270*(
E+P=0)+300*(R+P=0))
150 LET E=SQR (P*R)
160 LET I=P/E
170 GOTO 320
180 LET I=P/E
190 LET R=E*E/P
200 GOTO 320
210 LET I=E/R
220 LET P=I*E
230 GOTO 320
240 LET E=P/I
250 LET R=E/I
260 GOTO 320
270 LET E=I*R
280 LET P=I*E
290 GOTO 320
300 LET R=E/I
310 LET P=I*E
320 PRINT I;" AMPS"
330 PRINT E;" VOLTS"
340 PRINT R;" OHMS"
350 PRINT P;" WATTS"
```

ZX81 - TS1000

SOFTWARE

DR. FLOYD

Psychoanalysis by computer? - well, not quite but Dr. Floyd will carry on a conversation with you using psychoanalytic techniques giving the appearance of artificial intelligence. Requires 16K RAM. $10.95

GRAPHICS PAC I

An introduction to Sinclair graphics - includes a 1K Line Doodler, a 16K Super Line Doodler, several random drawing programs and a Screen Formatter. Kids will love all of them. The screen formatter will satisfy serious programmers. Requires 16K for full use but simpler sections will run with 1 or 2K. $10.95

WORD PLAY

Fun with words - 2 jargon generating programs for grown ups, 2 story writers for children and a bonus secret message program. Requires 16K. $9.95

All software is on high quality cassettes and is replacement guaranteed.

TO ORDER:

Send Check or MO
For the total + $4.00 S & H
Calif. residents add 6% tax.
or PHONE

805/482-3604

master charge VISA

For credit card orders, include all info on card.

HARDWARE

$45.95 SIN16 16K RAM

This RAM plug-in allows the user to run virtually all programs written for the ZX81 or TS1000. Completely assembled & tested

$135.95 SUPER SIN64 64K RAM

This is the maximum directly addressable RAM that your ZX81 or TS1000 can use - Memory is used as follows: 0-8K Sinclair operating ROM. 8-16K switches in or out of use. Used for assembly language routines, memory mapped peripherals. Contents are safe from NEW and cassette (disc) loads thus allowing progrom-to-program communications. 16-32K BASIC and assembly language user program area. 32-64K large data arrays & BASIC variables.

All hardware is completely compatable with Sinclair add-on products. Both RAMS use the mose reliable gold plated, bifurcated contact connector on the market.

10 day return privilege on all hardware-90 day parts and labor warranty-inexpensive extended service contract is available-
WE SERVICE WHAT WE SELL.

APROPOS TECHNOLOGY

350 N. Lantana Ave., Suite 821 • Camarillo, CA 93010

ZX-FORTH

Now you can have the SPEED and POWER of computers costing hundreds or even thousands of dollars more inside your ZX81. FORTH is now available on cassette for the 16K ZX81. *EASIER* to learn than BASIC and the most powerful language available for the ZX81 *10 TO 20* times *FASTER* than BASIC and typically uses less than *HALF* the amount of RAM space needed by an average BASIC program. Includes extentions for speedy graphics handling, as well as basic data handling functions. Sample programs written in FORTH included at no extra charge are: Scratch pad, a simple word processor, Breakforth and Arcade-type game. Also included is a complete bibliography and information about fig-FORTH, the international FORTH users group.

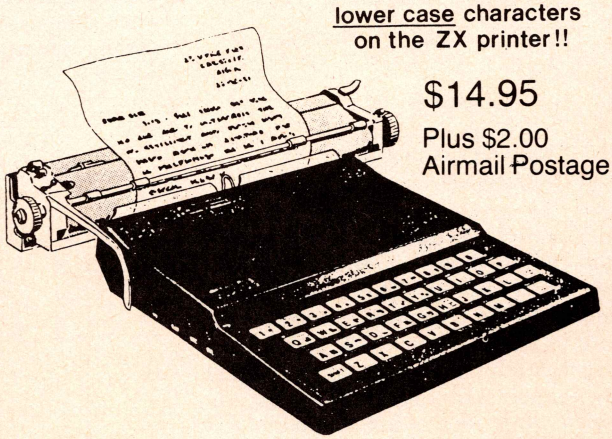
Find out why FORTH is gaining worldwide support as the state of the software art and have fun learning about computers the fast and easy way.

STRATOS CORPORATION
1451 N. UNION STREET
MIDDLETOWN, PA 17057

ZX-FORTH 16K CASSETTE $34.95
Add $2.00 shipping and handling.
Add $7.00 shipping and handling for foreign orders.

LTEXT AND ZTEXT ZX81 WORD PROCESSORS

lower case characters on the ZX printer!!



$14.95
Plus $2.00 Airmail Postage

No longer need you be confined to space games, battleships and the like. With these programs your ZX81 becomes a viable commercial machine. ZTEXT (upper case characters only) and LTEXT (upper and lower case characters) are word processors which incorporate a text editor and a formatter/printer. The text editor allows you to type test in and edit it. The formatter/printer takes the text and sends it to be screen or ZX printer, justifying it and formatting according to commands embedded in the text. Included in the range of commands are such useful operations as string search, string replacement and a merge facility enabling a skeleton document to be filled with variable information. LTEXT caters for both upper and lower case characters. No, that is not a misprint. By utilising the high resolution graphics feature of the ZX printer Graham Asher has built a complete set of lower case characters. These program come complete with a detailed manual.

Send $2.00 (redeemable against first order) for full catalogue and FREE listing. Please state ZX81 on order.
All prices include VAT and P&P available from
Oasis Software, 20 Canterbury Close, Worle, Weston Super Mare, England
Dealer inquiries invited

ACCESS ORDERS TAKEN BY PHONE 24 HOURS A DAY

OASIS SOFTWARE

Repeat Key Option

George R. Ingle

Ed.—**A WORD OF CAUTION:** *Any hardware project for your computer must be approached with extreme caution.* **SYNC** *cannot be responsible for any problem that may arise from attempting hardware projects. Obviously, any damage to your computer can be costly in time and money.*

A repeat key option is relatively simple to build and install. In addition to IC sockets, wire, and a suitable mounting board, one of each of the following parts is required:

555 timer IC.

74LS244 octal non-inverting tri-state bus driver.

100uF miniature electrolytic capacitor rated 15v or greater.

1K ohm resistor rated 1/4 watt.

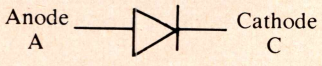
5 or 10K miniature POT.

SPDT miniature switch.

The steps in construction are as follows:

1) Connect all components. Lead lengths and component placement are not critical. Good soldering practices should be followed, as usual. See Figure 1.

Figure 1: Typical Diode.



Typical Diode

D1C=Diode 1 Cathode
D1A=Diode 1 Anode
etc. for all connections

2) *Carefully* de-solder and remove the eight 1n4148 diodes in series with the keyboard contacts. These diodes are soldered to the computer printed circuit board in plated-through holes. You must be very careful not to damage the signal line connects to these holes. On the Sinclair these diodes are numbered D3 through D10; on the MicroAce, D1 through D8.

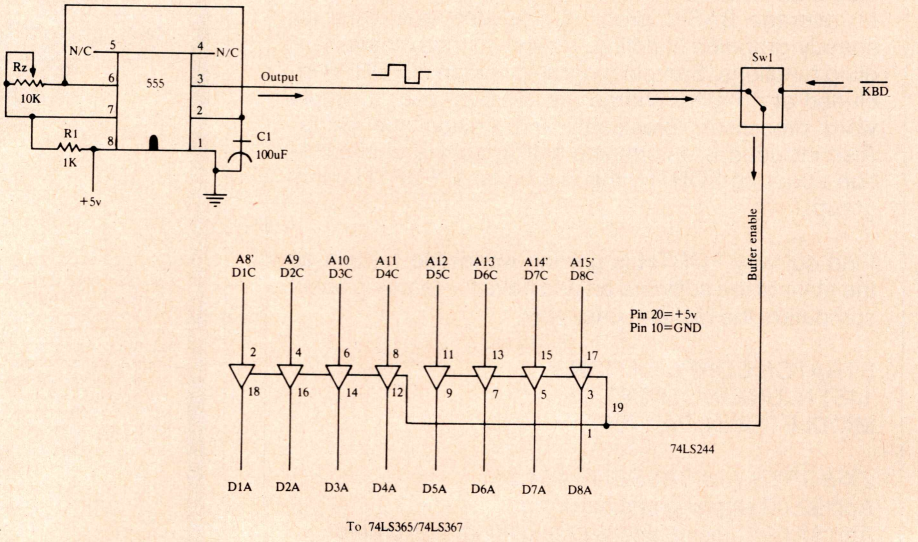
3) *Carefully* solder the wires to the diode holes as shown. Make sure that solder flows through the holes and makes a good connection.

4) Connect the chip grounds and 5v pins to a place on the circuit board. Just about any connection supplying the necessary voltages can be used except the 5v input to the VHF/UHF modulator. This would result in unwanted "noise" created by the 555 timer being sent to the TV and causing distortion in the display.

5) Install and connect the switch. This switch allows you to select the repeat function or to return the keyboard to its normal operating state. The logic low KBD signal can be tapped at pin 1 on IC 10 for the Sinclair or pin 1 on IC 11 for the MicroAce. This keyboard signal, when connected to the 74LS244 allows normal operation of the keyboard. See Figure 2.

6) Set the repeat rate or frequency by adjusting the 5 or 10K POT. The repeat rate selected will remain stable, but keep in mind that the repeat rate will be slower on a ZX81 or MicroAce equipped with the video upgrade operated in the slow mode since these machines insert additional delays generated by the retiming character display frequency. Too high a repeat rate will make you "outrun" the keyboard scan frequency used by the Z80 during an IORQ and RD. This will not be a problem since the rate at which this occurs is very difficult to follow with your eyes!

Figure 2: Schematic for Keyboard Repeater.



George R. Ingle, 24593 1/2 Monterey Ave., San Bernadino, CA 92410.

"Touch-A-Matic™", Power At Your Finger Tips!

$9.95

KOPAK'S TOUCH-A-MATIC™ gives you the power to type more accurately and much faster. It requires no wires, no soldering. Comes with complete instructions. It's as easy as removing adhesive backing and pressing into position. Positioning is easy. Once in position, you are ready for touch-typing with ease.

Our unique vinyl-key-hold creation will guide your fingers to the correct keys. Finally, touch-typing now possible with your Sinclair* or Micro-Ace*.

This remarkable product, as well as other **KOPAK** items, are now available. Call now to order through MC/Visa or send check/M.O. to **Kopak Creations, Inc.**

TM Trademark of KOPAK Creations, Inc.
Sinclair* is a trademark of Sinclair* Research LTD.
MicroAce* is a trademark of MicroAce*

KOPAK CREATIONS, INC.
(212) 757-8698
Master Charge & Visa Accepted

$1.50 Handling Charge

Dept. SY1 448 West 55th Street, New York, NY 10019 (212) 757-8698

8K ROM
1K RAM

Degrees, Grads, and Radians

Alvin Lam

There are three methods of measuring angles: degrees, grads, and radians. However, the ZX81 with all its new trigonometric functions can only measure angles in radians. You can convert a measurement by any of the three methods to either of the remaining methods with the few short programs given in the listings below. You may want to add a REM statement to identify each listing for use in a program.

Type in the program you need. Hit RUN and ENTER. One prompt will appear on the screen, e.g., in Listing 1, RADIANS=. Type in the number of radians you want converted to degrees and press ENTER. The answer will appear.

Alvin Lam, 690 Sunset Pkwy., Novato, CA 94947.

Listing 1: Radians to Degrees.

```
10 PRINT "RADIANS=";
20 INPUT R
30 PRINT R
40 LET D=R*180/PI
50 PRINT "DEGREES=";D
60 STOP
```

Listing 2: Degrees to Radians.

```
10 PRINT "DEGREES=";
20 INPUT D
30 PRINT D
40 LET R=PI*D/180
50 PRINT "RADIANS=";R
60 STOP
```

Listing 3: Radians to Grads.

```
10 PRINT "RADIANS=";
20 INPUT R
30 PRINT R
40 LET G=63.661977*R
50 PRINT "GRADS=";G
60 STOP
```

Listing 4: Grads to Radians.

```
10 PRINT "GRADS=";
20 INPUT G
30 PRINT G
40 LET R=G/63.661977
50 PRINT "RADIANS=";R
60 STOP
```

Listing 5: Degrees to Grads.

```
10 PRINT "DEGREES=";
20 INPUT D
30 PRINT D
40 LET G=D/.9
50 PRINT "GRADS=";G
60 STOP
```

Listing 6: Grads to Degrees.

```
10 PRINT "GRADS=";
20 INPUT G
30 PRINT G
40 LET D=G*.9
50 PRINT "DEGREES=";D
60 STOP
```


COSMONICS

ZX81 HARDWARE/SOFTWARE EXTENTIONS

CS 17 Cassette Read/Write Utilities. Allows the user to selectively read & write strings and arrays to a cassette, which can be used by the same program or a different program.
CS 17 .....cassette **$20.00**
CS 21 Software for TTL Serial Output Port. Provides correct RS232 timing; provides Sinclair character set translation to ASCII.
CS 21 .....cassette **$10.00**
***CH 21** Complete Plans for 2 IC Serial Output Port for ZX81.
CH 21 .....plans **$10.00**
***CH 21K** 2 IC Serial Ouput Port Kit for ZX81 (complete plans and parts)
CH 21K .....kit **$15.00**
CS 22 Software for Serial Input. Provides RS232 input timing and provides ASCII to Sinclair character translation.
CS 22 .....cassette **$10.00**
***CH 22** Complete Plans for ZX81 Serial Imput Port.
CH 22 .....plans ..... **$ 5.00**
CH 24 Complete Plans for RS232⟷TTL Level Converter.
CH 24 .....plans **$10.00**
CH 46 46 pin edge connector for ZX81.
CH 46 .....connector ..... **$ 8.00**

All cassette software listed here requires a minimum of 2K RAM
*Note: Any modification made on the ZX81 may invalidate the Sinclair warranty.
Please add $1.50 postage and handling with each order.
California residents add 6% sales tax.

COSMONICS, Box 10358, San Jose, CA. 95157

PRACTICAL ZX-81™ SOFTWARE

ZX-PANDING LTD.

ZX-81™ Not Just For Games Anymore!

ZX-PANDING, LTD., an American company, uses the tremendous ZX-81™ data handling capabilities to make our daily tasks easier. Programs are on cassette, thoroughly tested, with easy-to-read printed instructions, written in BASIC to allow tailoring to your special needs.

1. **YOUR SPECIAL DAY**—1K—Good example of using successive equations to answer a practical question. Enter *any* date in history, and ZX-81™ will tell you the day of the week on which it occurred. Useful in many fields and a great ZX-81™ demonstration. .....ONLY **$3.75***
2. **CLOCKS AND TIMERS**—1K—A digital clock (standard or military time), a count-up timer (for telephone calls), and a count-down timer (useful in cooking). Another great ZX-81™ demonstration .ONLY **$3.75***
3. **ANYPOINT PLOTTER**—1K—Crunches any data to allow graphing of any positive data points: stock prices, temperature, experimental data, etc. . . . ONLY **$3.75***
4. **CHECKBOOK, INCOME TAX AND BUDGET ORGANIZER**—16K A powerful yet easy to use finance program—10 jobs in menu driven format. Checks and deposits are totaled and itemized under desired categories for budget planning and income tax preparation. Makes checkbook balancing easy. Ninety transactions manipulated at one time with 16K . .ONLY **$13.75***

ALL 3 FOR ONLY $8.75!

ZX-PANDING, LTD.
P.O. BOX 25
NEWTON, NC 28658

Free catalog with self addressed stamped envelope.
*ALL orders please add $1.25 to total order to cover POSTAGE AND HANDLING. (Foreign orders add $2.00 to cover air costs. Your payment must be in a U.S. dollar draft payable to U.S. bank.)

Rounding Off with Conditional Tests

James E. Stauffer

We have all learned in plane geometry classes the Pythagorean theorem: *a* squared plus *b* squared equals *c* squared. Thus, if we know two sides of a right triangle, we can easily calculate the third. Or can we?

My son pointed out a Basic program for finding "Pythagorean triples" in his geometry textbook (Jurgensen, Donnelly, Maier, and Rising. *Geometry*. Boston: Houghton Mifflin Co., 1978). These are the solutions to a right triangle when all three sides are positive integers. I translated the program into ZX81 Basic as follows:

```
10 FOR A=1 TO 20
20 FOR B=A TO 20
30 LET C=SQR(A*A+B*B)
40 IF C< >INT C THEN GOTO 60
50 PRINT A;TAB 5;B;TAB 10;C
60 NEXT B
70 NEXT A
```

James E. Stauffer, 6076 Chinaberry Dr., Columbus, OH 43213.

Then we ran the problem, and the display appeared as follows:

```
8  15  17
0/70
```

This result was a surprise. What had happened to the famous 3, 4, 5 triangle, let alone all the other solutions we were sure were there? It was obvious from the display that the program was working and that it had exhausted all possible values of A up to 20, stopping at line 70.

The problem had to be in the conditional test in line 40 which says in effect, "PRINT only solutions in which C is an integer." Some of the obvious solutions must be failing the test.

We decided to see what was happening by going to the immediate mode, i.e., entering text without line numbers, and typed:

```
LET A=3
LET B=4
LET C=SQR(A*A+B*B)
PRINT C
```

The screen display showed 5, which is an integer, or is it? Knowing that some algorithms, such as SQR, produce round-off errors, we next tried:

```
PRINT C-INT C
```

The number 1.8626452E-9 appeared. Here was the problem. A tiny error, outside the display range of the ZX81 had caused many solutions to fail the conditional test of line 40, which demands that INT C be *exactly* equal to C. The solution then was to rewrite line 40 to permit small errors in the SQR solution for C:

```
40 IF C-INT C>0.000001 THEN GOTO
60
```

When we ran the problem with this change, we got the following results:

```
 3   4   5
 5  12  13
 6   8  10
 8  15  17
 9  12  15
12  16  20
15  20  25
0/70
```

These are the proper solutions for all Pythagorean triples for sides A and B less than or equal to 20.

ZX81 users must be prepared to accept slight imperfections when the computer is dealing with non-arithmetic functions. The algorithms used are powerful, but some round-off errors may be present. ■

UNFORGETTABLE MEMORIES

NONVOLATILE MEMORY AND PORTS

- 4 - 2K sockets for expansion RAM and/or popular 2716 EPROMS
- 6 - 8 bit I/O ports
- Sinclair memory module interface

This I/O unit can utilize combination of EPROM, static RAM, or nonvolatile RAMs. Put often-used USR routines in EPROM or NOVRAM for easy access, or use 2K static RAMs for storage not affected by tape commands. Our ports are easily accessed using BASIC PEEK and POKE, or at very high speeds with USR routines. The Wisconsinc I/O unit has 24 input and 24 output lines.

Your memory module will plug directly onto our I/O unit. Address lines are buffered for reliable memory operation. Power your ZX-81, the I/O unit, and peripherals like our EPROM programmer with our optional power supply.

I/O UNIT

Assembled and tested $99
Kit with complete instructions .. $79
Optional power supply $19

32K MEMORY WITH 4 I/O PORTS

- Large memory capacity greatly enhances ZX-81 computing power
- 2 input and 2 output ports
- Use with our EPROM programmer

This memory is designed for economy and flexibility, complete with aluminum enclosure and power supply. We also feature our professional p.c. board with connector for the budget minded. Either way you get complete instructions for the 32K with ports.

Our 32K memory provides you with up to 16K for BASIC program and at least 16K for variable storage. This allows the use of large arrays, which is especially useful to scientific students.

32K MEMORY WITH PORTS

Complete kit with instructions . $166
16K version, kit $131
Bare board with connector .. $ 40

LOW COST EPROM PROGRAMMER

- Programs popular 2716 EPROM
- EPROMs compatible with our I/O unit
- Save USR code in nonvolatile EPROM
- Requires 3-port interface to ZX-81

Programmer hardware with software will program or copy an EPROM. Use EPROMs in our I/O unit and have your own USR routines at your fingertips.

EPROM PROGRAMMER

Assembled and tested $79

TERMS:

Wisconsin residents add sales tax. Please add $4.95 for shipping and handling. Check or Money Order only. Allow 4-6 weeks for delivery.

WISCON /// /////// SINC

Wisconsinc Electronics
PO Box 332
Milton, WI 53563

8K ROM
1K RAM

Block Transfers: Horizontal Scrolling on your 1K ZX81

John Scher

A programming technique called block transfers of memory adds new possibilities for your programming and for taking advantage of your computer's capabilities. Although the technique involves the use of machine language, this article assumes only that you are familiar with the Sinclair manual *ZX81 BASIC Programming* and that you are willing to work with hexadecimal. Dr. Ian Logan's article, "An Introduction to Machine Language" (*SYNC* 1:6) is helpful, but not essential.

For some readers learning may be its own reward. For those who want a more concrete incentive, this article will show how to modify Douglass D. Sharp's LSCROLL routine (*SYNC* 2:2) for a 1K machine. Using this routine, you will be able to launch a fleet of jets, in formation, across your TV screen . . . that is, after a little homework.

What is a Block Transfer?

We must begin by defining a block of memory. This is the information held in a set of sequential addresses in the memory of the computer. The contents of a REM statement, for example, constitute such a block. A block transfer of this information would write the contents of the block into a different area of memory. That is, the sequence is reproduced at a new starting address. Furthermore, the original sequence is not disturbed unless the "source" and "destination" areas overlap.

RAMTOP

To use this programming technique, we must first understand the systems variable called RAMTOP. Reviewing the information on RAMTOP in *ZX81 Basic Programming*, Chapter 26, would be helpful at this point. The discussion below draws on this chapter and supplements it.

John Scher, 222A Hamilton St., Cambridge, MA 02139.

When you turn on the ZX81, it tests to see how much memory it has to work with and then stores the address of the first non-existent byte for future reference. This address is called RAMTOP. It is stored at addresses 16388 and 16389. For example, if you have 1K RAM, type:

```
PRINT PEEK 16388+256*PEEK 16389
```

and ENTER. This will tell you that the address of the first non-existent byte is 17408. This is RAMTOP.

You can change RAMTOP by POKEing the appropriate values into addresses 16388 and 16389 then typing NEW and ENTER. For example, suppose that you want to establish RAMTOP at 17388. You would type POKE 16388,236 and ENTER; then POKE 16389,67 and ENTER, and then NEW and ENTER. These values produce the new RAMTOP address by the following calculation:

```
236+256*67=17388
```

This POKEing will fool the machine into thinking that there is no usable memory above RAMTOP (17388).

As a result nothing above that address will be disturbed by the Basic system. The area above RAMTOP is also undisturbed by LOADing a new program into the machine. The usefulness of this area cannot be overemphasized because it gives the user a place to store machine code, Basic data arrays, and other memory blocks. These are then available for use in multiple Basic programs without having to type in the machine code or data each time you want to use it.

The only disadvantage of this area is that it is not saved by SAVE. This is why block transfers are so useful. They allow the transfer of information from a SAVEable area of memory to one that is undisturbed during program LOADing.

A Basic Program for a Block Transfer

Figure 1 shows a block transfer program in Basic. This program locates the bytes, in this case X's, in the REM statement and transfers them to a new starting address. The address of the first X in the REM statement is 16514. Before using such a program to place machine code bytes above RAMTOP, you must first reserve space above RAMTOP as we have already discussed.

The bytes in Figure 1 could just as easily be in an array or another Basic variable. Either of these would be similarly SAVEable, although locating the starting address for a block transfer would be a bit more difficult.

Figure 1. A Basic Program for Block Transfer.

```
 1 REM XXXXXXXXXX
10 FOR N=0 TO 9
20 POKE 17398+N,PEEK (16514+N)
30 NEXT N
```

The LDIR Instruction

Given that much of the work of a computer is moving things from one address to another, it is not surprising that the Z80(A) microprocessor has a command that can accomplish a block transfer much more quickly and efficently than a Basic program like that in Figure 1. This is the "Repeating Block Load With Increment" instruction, LDIR. The LDIR instruction makes use of three register pairs: BC, DE, and HL. Initially, the BC register pair must hold the number of bytes that you want to transfer, just like the FOR-NEXT loop in Figure 1. The DE pair holds the first address in the "destination" block of memory, and the HL pair holds the first address in the "source" block of memory. The LDIR instruction

transfers the contents of the address held in the HL pair to the address held in the DE pair. Then it increments HL and DE (i.e., adds 1) and decrements BC (i.e., subtracts 1). It then compares the BC pair to zero, and, if BC is not equal to zero, the instruction is repeated, otherwise the next instruction is executed.

Although we will use LDIR in the sample programs in this article, you should know that LDIR has a cousin, LDDR, which is similar except that it decrements all three registers. You might think about which of these two you would use to transfer overlapping memory blocks.

An Overview of the Process

At this point let me summarize what we are going to do. We will enter a machine code block transfer program along with a sample machine code routine to be transferred into the space above RAMTOP. Then we will transfer this block of memory to a SAVEable REM statement. At this point, a few modifications will be made, and then we will try out LSCROLL with a sample Basic program. There are slightly easier ways to achieve the same end result, but this sequence will teach you the most.

A Machine Language Block Transfer

The first step in entering the machine language block transfer program is to reserve 184 bytes above RAMTOP by typing POKE 16388,72 and ENTER, then POKE 16389,67, and ENTER, and then NEW and ENTER. Now that you have reserved the necessary space above RAMTOP, enter the hex loading program shown in Figure 2 (from Booth, "The Game of Life Revisited," *SYNC* 2:1, p. 20).

When you RUN this program, the screen will prompt you for a byte in hexadecimal. Refer now to Figure 3, which lists the block transfer machine code. Note that the first nine bytes (contained in addresses 17224-17232) set up the BC, DE, and HL register pairs (LD stands for load) as discussed above. The next two bytes perform the transfer, and the last returns the computer to Basic. Note that all addresses within an LD instruction, for example, 4082h = 16514d, are entered lower-order-byte first, higher-order-byte second, in the same manner used to change RAMTOP. Remember that a 0 in a hexadecimal listing such as in Figure 3, column 2, is always a zero and never the letter O.

Now that the screen is prompting you for an entry, enter the bytes in Figure 3, column 2 (i.e., type 01 and ENTER, then B8 and ENTER, etc.). Then go directly to Figure 4 without typing RUN and continue by entering the LSCROLL sequence. The parentheses and asterisks will be explained later. For now just ignore them (i.e., type 3A and ENTER, then FE and ENTER, then 43 and ENTER, etc.). If you make a mistake while entering this machine code, note that line 280 in Figure 2 gives you a backspace key, "/". When you are done entering the machine code in Figure 4, type END and ENTER, and the loading program will STOP. At this point you should check to be sure that you did not leave out a byte or two accidently by typing PRINT PEEK 17405 and ENTER. The number 201 should appear at the top of your screen (201d = C9h). Congratulations if you have come this far without leaving anything out!

Next, SAVE the hex loading program for future use. Then type NEW and ENTER to clear out the memory for the REM statement that we will use as the destination block of memory. Put the computer into FAST mode to enter the REM statement, otherwise it will take forever. Type 1 REM and then 184 X's, as in Figure 1, and ENTER. You can change back to SLOW mode now.

Transferring LSCROLL

Now you are ready for the block transfer. Type RAND USR 17224 and ENTER. The transfer will occur so fast that you will think that you made a mistake. Type ENTER again and you will see the first few bytes of machine code in the REM statement. If this does not occur you had better PEEK a few addresses between 17224 and 17235 to look for mistakes.

Before you SAVE the REM statement, a few changes must be made so that in the future, when you LOAD the program, the block transfer will work in the other direction, that is, it will transfer LSCROLL from the REM statement to above RAMTOP. Also, the first twelve bytes need not be transferred because they make up the block transfer routine, not the LSCROLL routine. Figure 5 shows the changes you must make. Column 1 lists the addresses that the block transfer machine code routine occupies in the REM statement, and column 2 is identical to column 2 in Figure 3 for comparison. Column 3 gives the decimal values which must be POKEd in. Type POKE 16515,172 and ENTER, then POKE 16518,84 and ENTER, etc. until you have POKEd all five changes in. *Now* SAVE "LSCROLL".

In the future, when you want to use LSCROLL, reserve 172 bytes above RAMTOP (POKE 16388,84; POKE 16389,67; NEW), then LOAD "LSCROLL" and transfer it to the space above RAMTOP by typing RAND 16514. In fact, you should do this now to reclaim the twelve bytes of memory above RAMTOP that were needed before to make the block transfer to the REM statement. You will need all the memory available for the sample Basic program in Figure 6.

Figure 2. Hex Loading Program.

```
 200 LET V=-1
 210 LET V=V+1
 220 IF INT (V/50)*50=V THEN CLS

 230 IF INT (V/10)*10=V THEN PRI
NT
 240 INPUT H$
 250 IF H$="" THEN GOTO 240
 260 PRINT H$;"#"
 270 IF H$="END" THEN STOP
 280 IF H$="/" THEN GOTO 310
 290 POKE 17224+V,16*CODE (H$)+C
ODE (H$(2))-476
 300 GOTO 210
 310 LET V=V-1
 320 GOTO 240
```

Figure 3. The Block Transfer Machine Code.

Decimal Address	Hex Code	Instructions
17224	01	LD BC,#of bytes
17225	B8	00B8h=184d
17226	00	
17227	11	LD DE,destination
17228	82	4082h=16514d
17229	40	
17230	21	LD HL,source
17231	48	4348h=17224d
17232	43	
17233	ED	LDIR(transfer)
17234	B0	
17235	C9	RET(return)

Figure 4. The LSCROLL Sequence.

```
17236-17407  ENTER the LSCROLL
sequence:   3A(FE.43)FE.16.DA(61
.43)3E.00.32(FE.43)3A(FF.43)D6.0
0.CA(71.43)FE.15.D2(71.43)C3(76.
43)3E.16.32(FF.43)F5.3A(FF.43)47
.F1.3A(FE.43)80.FE.16.DA(95.43)2
6.00.2E.16.3A(FE.43)4F.06.00.ED.
42.7D.32(FF.43)ED.5B.0C.40.0E.FF
.F5.3A(FE.43)6F.F1.26.00.06.00.1
A.FE.76.CA(AF.43)13.C3(A5.43)0C.
A7.E5.ED.42.E1.CA(BC.43)13.C3(A5
.43)06.00.F5.3A(FF.43)4F.F1.C5.D
5.E1.23.7E.FE.76.C2(C7.43)E5.A7.
ED.52.2B.7D.4D.D6.00.E1.C2(E0.43
)E5.D1.C3(F5.43)3D.C2(E8.43)13.C
3(F1.43)06.00.0B.13.D5.E1.23.ED.
B0.3E.00*12.13.C1.0B.79.D6.00.C2
(C4.43)C9.00*00*
```

Figure 5. Changes for Transfers from REM to above RAMTOP.

Decimal Address	Hex Code	Code Changes	Instructions
16514	01		
16515	B8	→AC=172d	,change #bytes
16516	00	→00	,no change
16517	11		
16518	82	→54= 84d	,change dest.
16519	40	→43= 67d	,4354h=17236d
16520	21		
16521	48	→8E=142d	,change source
16522	43	→40= 64d	,408Eh=16526d
16523	ED		
16524	B0		
16525	C9		

Using LSCROLL from above RAMTOP

Once you have LSCROLL above RAMTOP, type NEW and ENTER to get rid of the REM statement. Now you have enough space to enter the Rockets program in Figure 6. Note that the Rockets program POKES three addresses in the LSCROLL routine, 17394, 17406, and 17407. These addresses correspond to the

Figure 6. Rockets Program Listing.

```
 1 REM ROCKETS
 4 POKE 17394,14
 5 FOR H=6 TO 14
10 PRINT AT H,31;"■"
15 NEXT H
17 FOR M=0 TO 4
20 POKE 17406,10-M
30 POKE 17407,1+2*M
35 FOR N=0 TO 32
40 RAND USR 17236
45 NEXT N
50 NEXT M
60 CLS
70 GOTO 5
```

bytes in Figure 4 that are followed by asterisks. The function of these addresses is as follows:

17394 specifies the code for the character which will occupy the new spaces created by LSCROLLing.

17406 specifies the line number at which to begin LSCROLLing; POKE in a number from 0 to 21; see *ZX81 BASIC Programming*, p. 89.

17404 specifies the number of lines to be LSCROLLed, including the first one; POKE in a number from 1 to 22.

Add 1024 to these addresses if you have 2K RAM (see below). Rockets calls the LSCROLL routine with the line 80 RAND USR 17236 since the starting address of the LSCROLL routine is 17236.

Now comes the moment of truth. RUN Rockets. If you have come this far without making a mistake, you will see a line of jets form on the right side of the screen and take off across the screen in formation, leaving their contrails behind.

For More Than 1K RAM

Those with more than 1K RAM may want to locate LSCROLL at a higher starting address. For instance, if you have added 1K for a total of 2K RAM, you have an additional 1024 bytes. Therefore you could move RAMTOP to 18260 (17236 + 1024) for the final run which only requires 172 bytes. Do not forget that the hex loading program requires 184 bytes above RAMTOP. You will have to make these changes to move RAMTOP.

First, add 1024 to the following addresses in the figures:

Figure 2: Line 290.

Figure 3: all addresses in column 1.

Figure 6: Rockets Program: all addresses.

Next you must change some of the machine code.

Figure 3, column 2: change the 9th byte from 43 to 47.

Figure 5, column 3: 43 = 67d to 47 = 71d. Note that we have been adding 4 to the higher-order-byte of a series of addresses because 1024/256 = 4.

Figure 4: The parentheses contain addresses of information or routines within the LSCROLL program. For instance, the first parenthesis (FE.43) contains address 43FEh = 17406d. Add 4 to the higher-order-byte, 43, in all the parentheses. Thus the first parenthesis should read (FE.47). The program is ready for use at the starting address, 18260.

If you have more than 2K, make sure that you understand the changes suggested for 2K users, then give the changes best for your machine a try. One last word of caution: look over the article and write in the changes you will want to make in the addresses in the text, as well as the addresses referred to in the figures.

As you can see, LSCROLL is a superb program in that it allows the user to chose exactly which part of the screen to scroll. You are now ready to try some of your own programs with the LSCROLL routine. The program has many other virtues that are detailed by the author, and I give it the highest rating of any machine code program that I have seen in *SYNC*. ■

HE SAID YOU COULDN'T DO IT
WE DID IT!

REVOLUTION IN TEACHING PROGRAM TECHNIQUES
APPRECIATE THE REAL VALUE OF YOUR COMPUTER

READ ZX81 HORIZON (WITH TAPE)

LEARN TO LINK COPY MOVE & MERGE
NO PROGRAMMER SHOULD BE WITHOUT THIS BOOK

CONTENTS.
Detective,
Billiards,
Machine Code Programmer,
Call Back Routine,
File Text,
Animated Cylist,
Load & Save,
We can accept no responsibility for any illegal use of these programs.

From:
NAME _____
_____
ADDRESS _____
_____

To:
Uitgeverij Wolfkamp
Postbus 70254
(1007KG) Amsterdam.
Netherlands.

Tel: Amsterdam 020-278931

Payment must be included with Order. Price $24.95 including Postage & Packing.
Credit cards are accepted.

practical software

FOR THE SINCLAIR ZX80/81 (8K/16K)

2 Unique computer programs on cassette

ZX INVENTORY
- STORAGE OF 200 ITEMS AND PRICES
- PRINTING CAPABILITY (ZX81)
- COMPREHENSIVE SEARCH ROUTINES

ZX DIRECTORY
- SORTS FILES ALPHABETICALLY
- STORAGE OF 60 FILES (16K)
- PRINTING CAPABILITY (ZX81)
- COMPREHENSIVE SEARCH ROUTINES

BOTH PROGRAMS EASILY MODIFIED TO STORE MORE FILES WITH LARGER RAM PACK.

ONLY 19.95 EA.
BOTH PROGRAMS FOR 34.95

SEND CHECK OR MONEY ORDER TO:

SERVITRONICS

P.O. BOX 2024, HARTFORD, CONN. 06145
FOR INFORMATION OR VISA OR MASTERCARD ORDERS
CALL (203) 643-7900 SHIPPING U.S. $1.50 OUTSIDE U.S. $3.00

Add Sound to Your ZX81!

Sounder circuit fits inside the ZX81.

No cutting, soldering, or unsoldering.

Circuit beeps when key inputs are accepted by the computer.

Send $12.00 per unit plus $2.00 postage and handling
(N.J. Residents add 5% Sales Tax)
to

KML Incorporated
P.O. Box 1147
New Brunswick, N.J. 08903

PREMIUM CASSETTES

COMPUTER GRADE
100% ERROR-FREE
FULLY GUARANTEED

MANUFACTURER PRICES

The Micro-Trac™ Generation
- High Frequency Response
- Wide Dynamic Range
- *Used by Software Firms & Computer Hobbyists*
- Choice of School Districts Nationwide

LENGTH	12-PAK	24-PAK
C-05	$ .69	$ .59
C-10	$ .79	$ .69
C-20	$ .99	$ .89
C-30	$1.19	$1.09
C-60	$1.49	$1.39
C-90	$1.79	$1.69
*CASES	$ .21	$ .20

*Cases recommended to protect sensitive cassettes.

—UPS SHIPPING—
(No P.O. Boxes please)
$2.00 (12-pak) $3.00 (24-pak)
—Canadian shipping multiply by 2—

#1 COMPUTER TAPE IN THE USA!

—write for volume prices—

TOLL-FREE
(orders only)
1-800-528-6050
ext. 3005
In Arizona
1-800-352-0458
ext. 3005

VISA

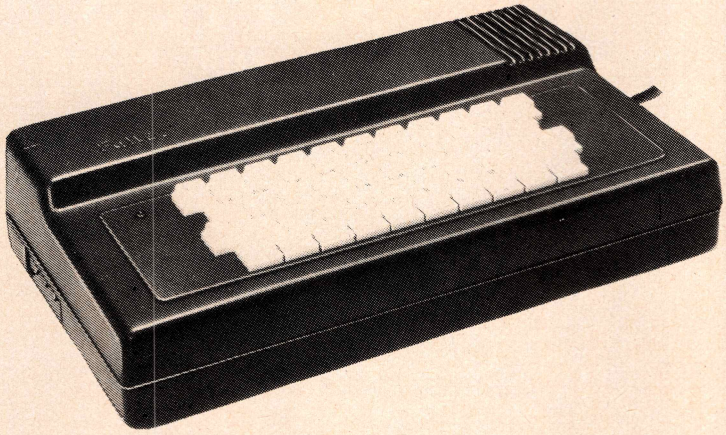
master charge

MICRO-80 ™ INC.

2665 Buzby Road
Oak Harbor, WA 98277
—Distributors Wanted—

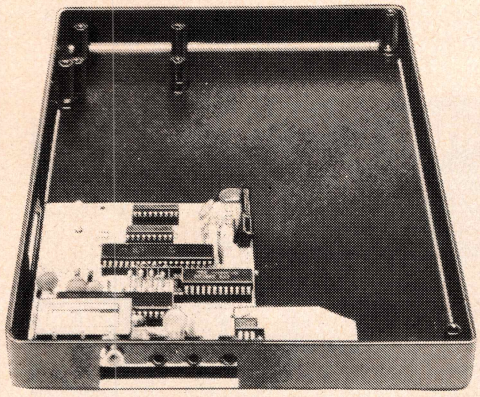
FULLER FD SYSTEM $79.95

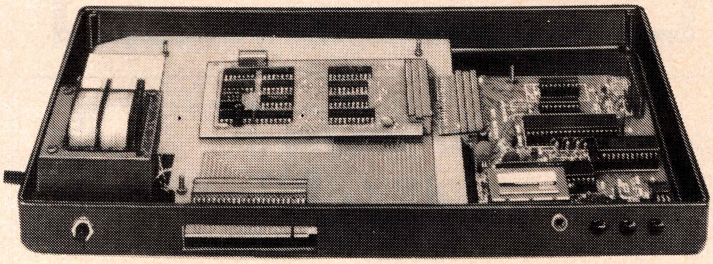
Professional Keyboard & Case for Sinclair ZX81/TS-1000



The ZX81 fits inside.
The tough ABS injection moulded plastic case measures 8" x 14" x 2½" and hooks up to your ZX printed circuit board in minutes. No technical know how or soldering is required.

KEYBOARD LAYOUT:
All the Sinclair ZX81 keys are duplicated on our layout, with extra shift and new line keys. The professional momentary action key switches have a guaranteed life of 10^6 operations. The unit is fully built tested and comes complete with a money back guarantee.





INSTALLATION
Simply unscrew the ZX printed circuit board from its case and screw it into the FD Case.

MOTHERBOARD:
We also manufacture a mother board which allows expansion to the ZX memory and I/0 facilities WITHIN the case, as well as our power supply unit and reset switch.

AD Code	SY-910

		Price †	Qty	Amount
Fuller	FD System 42 Keyboard & case	79.95		
	FD System Motherboard	29.95		
	FD 16K. Memory Module	49.95		
	FD 64K. Memory Module	149.96		
	FD PSU 9 Volts at 2 amp.	14.95		
	FD *Shipping and Handling*	6.00		

Mail to **FULLER MICRO SYSTEMS,**
The ZX Centre, Sweeting Street, Liverpool 2. England, U.K.

Name .....

Address .....

† US Dollars City/State/Zip .....

4K ROM
2K RAM

Chase

Kenneth Yu

Chase is a game of survival. The object is to survive as long as you can. You are set in a playing field, shown as a 20x10 block on your TV screen, surrounded by a lethal fence. Mines are scattered about in the field. You are being chased by five robots which will move straight toward you by means of their unerring sensors. You must destroy them before they destroy you; however, your only weapon is the minefield itself. Thus you must maneuver so that the mines will destroy the pursuing robots. But, beware! You also can be destroyed by touching the mines or the fence. Your energy goes up by one as each robot is destroyed. "H.S." means the highest score in previous games. Staying alive means that you must destroy as many robots as possible and hence beat the highest score. When your energy is higher than the H.S. shown, your energy will become the highest score in the next game. (At this point you may want to save the program again with the new high score.) If you are successful in destroying the five robots, you will be transported to another 20x10 field with a new mine configuration and five more robots chasing you.

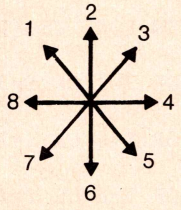
Because of the limited space, this program is a hybrid of machine language and Basic. By using machine language, the time that it takes to print the whole image along with the calculations is less than two seconds. Changes of the pattern during the game are POKEd directly into the screen instead of printing the whole pattern again.

The symbols used are:

+ (in inverse video)	= robot
* (in inverse video)	= you
X	= fence or mines
■	= fence

Kenneth Yu, 1145 West 32 Ave., Vancouver, B.C. V6H 2H8, Canada.

You control your movements by pressing the number keys according to the following diagram:



Directions:

1) Enter Listing 1, lines 1-660. At this point SAVE the program and SAVE it frequently from here on.

2) From this point on do not press RUN, CLEAR, HOME, or LIST without a line number.

3) Type in Listing 2. Then enter GOTO 2000 without a line number and press NEWLINE.

4) Enter the values in Listing 3. After each number hit NEWLINE (do not enter the commas). This must be done very carefully.

5) Type in Listing 4. Enter GOTO 2000 without a line number and press NEWLINE.

6) Type in Listing 5. Then enter GOTO 2000 without a line number and press NEWLINE.

7) Delete lines 2000-2010 by typing just the number and NEWLINE.

8) Type in with no line numbers:
LET F=100 and NEWLINE
LET G=0 and NEWLINE

8) You are now ready to embark on the *Chase*. Press GOTO 50, and the *Chase* field will appear.

9) If you want a hyperspace leap, add the following lines:

365 IF Y=10 THEN LET C=RND(18)
367 IF Y=10 THEN LET B=RND(8)

However, you must shorten the print statements to accommodate these lines.

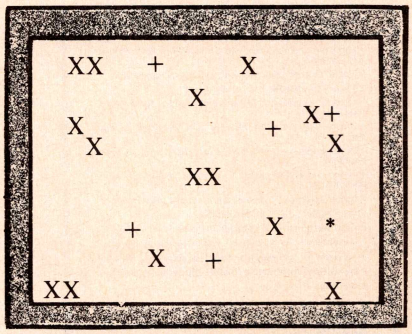
10) For those who want to modify the program:

USR(16427):
prints the outside fence of the field.

USR(16482):
gives the memory location of the screen.$

USR(16487):
increments the units of memory. ■

Sample Run



ENERGY 100 H.S. 100
LS

Z-WEST

FREE SOFTWARE!
in our sinclair user
NEWSLETTER

EVERY MONTH YOU WILL RECEIVE NEW PROGRAMS, ARTICLES AND INFORMATION ON ZX COMPUTERS.

for your sample copy send $1 to:

Z-WEST
PO BOX 2411
VISTA, CA. 92083

BARLOG SOFTWARE

- **EAGLE LANDER-1K** Moon landing simulation
- **PICTURE PLOT-1K** M/C Graphic routine
- **MEAL-A-MORPH-16K** Survival in cafeterias
- **TEXTER-16K** Text editor, printer commands

ALL LISTINGS $2.00

ALL WORK ON ANY 8K ROM MACHINE

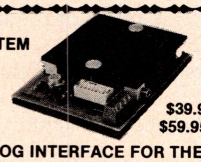
Send 20¢ for full list

ALL listings explain programs in detail.

Make check to:

BOB LUCAS
401 N. GEYER ROAD
KIRKWOOD, MO. 63122

VOTEM



$39.95 (KIT)
$59.95 (A&T)

ANALOG INTERFACE FOR THE ZX81

Welcome your computer to the "real world" of analog signal processing. VOTEM is a complete package, consisting of the necessary hardware and software to enable your computer to measure voltages and temperatures. VOTEM also includes circuitry that conditions the tape signal for dependable LOADs.

- Software compatible with Timex TMS-1000, Sinclair ZX81/80-(8K)
- Requires absolutely no modifications to computer
- Measures voltages and temperatures
- Probe provided for air and liquid temperature measurements
- Resolution is better than 14 bits (0.00005V or 0.04 degrees C)
- Voltage range of +1V can be expanded with on-board resistors
- Low power, requires less than 20mA at +11V unregulated
- Can be powered from computer's supply (cable included)
- Tape signal conditioning circuitry
- Tape signal monitoring capability (audio and visual)
- Manual includes detailed kit assembly and calibration
- Software for calibration and applications fits in 1K RAM
- Instructions for adapting to other Z80 computer systems
- Compact, 1" by 4" by 3"

Also, static RAM chips, 6116P-3 (2K by 8) with instructions for upgrading Sinclair ZX81 computer from 1K to 2K. Only $11.95 each. Send check or money order. Include $3 shipping and handling.

Down East Computers
P.O. Box 3096
Greenville, NC 27834

Listing 1.

```
  1 REM 12345678901234567890123
4567890123456789012345678901234
5678901234567890123456789012345
67890123456789012345678901234567890
 10 PRINT "YOU HAVE DESTROYED T
HE ENEMY"
 20 INPUT A$
 50 FOR D=1 TO 21
 60 LET A(20*E(D)+F(D))=0
 70 NEXT D
 80 IF G=5 THEN GOTO 110
100 LET K=100
110 LET G=0
120 RANDOMISE
130 LET A=USR(16427)
140 PRINT "ENERGY=";K,"H.S.";F
150 FOR D=1 TO 21
160 LET C=RND(18)
170 LET B=RND(8)
180 LET M=20*B+C
190 IF A(M) THEN GOTO 160
200 LET A(M)=61
210 IF D<6 THEN LET A(M)=147
220 IF D=6 THEN LET A(M)=148
230 LET E(D)=B
240 LET F(D)=C
250 POKE USR(16482)+M+B, A(M)
260 NEXT D
270 LET B=E(6)
280 LET C=F(6)
290 LET M=20*B+C
300 LET A(M)=0
310 INPUT Y
320 IF Y THEN POKE USR(16482)+M
+B,Ø
330 IF Y=1 OR Y=2 OR Y=3 THEN L
ET B=B-1
340 IF Y=5 OR Y=6 OR Y=7 THEN L
ET B=B+1
350 IF Y=1 OR Y=8 OR Y=7 THEN L
ET C=C-1
360 IF Y=3 OR Y=4 OR Y=5 THEN L
ET C=C+1
370 LET M=20*B+C
380 IF A(M)=61 THEN PRINT "YOU#
TOUCHED THE FENCE"
390 IF A(M)=147 THEN PRINT "YOU
#BUMPED INTO THE ENEMY"
400 IF A(M)=147 OR A(M)=61 THEN
#GOTO 660
410 POKE USR(16482)+M+B,148
420 LET A(M)=148
430 LET E(6)=B
440 LET F(6)=C
450 FOR D=1 TO 5
460 LET M=20*E(D)+F(D)
470 IF A(M)-147 THEN GOTO 610
480 LET A(M)=0
490 POKE USR(16482)+M+E(D),0
500 IF E(D)<B THEN LET E(D)=E(
D)+1
510 IF E(D)>B THEN LET E(D)=E(
D)-1
520 IF F(D)<C THEN LET F(D)=F(
D)+1
530 IF F(D)>C THEN LET F(D)=F(
D)-1
540 LET M=20*E(D)+F(D)
550 IF A(M)-61 THEN POKE USR(1
6482)+M+E(D),147
560 IF A(M)=148 THEN PRINT "YO
U HAVE BEEN DESTROYED"
570 IF A(M)=0 OR A(M)=148 THEN
#GOTO 610
580 LET K=K+1
590 LET G=G+1
600 LET A=USR(16487)
610 IF A(M)=0 THEN LET A(M)=14
7
620 IF G=5 THEN GOTO 10
630 IF A(M)=148 THEN GOTO 660
640 NEXT D
650 GOTO 270
660 IF K>F THEN LET F=K
```

Listing 2.

```
2000 FOR X=16427 TO 16506
2001 INPUT A
2002 PRINT A,
2003 POKE X,A
2004 NEXT X
```

Listing 3.

```
42,12,64,35,205,74,64,6,8,197,
54,9,35,6,18,54,0,35,16,251,54,
9,35,62,117,60,119,35,193,16,
234,6,20,54,9,35,16,251,62,117,
60,119,35,34,14,64,34,16,64,62,
13,50,37,64,201,42,12,64,35,201,
42,12,64,6,0,14,220,9,126,254,
37,40,02,52,201,54,28,43,24,244
```

Listing 4.

```
2000 DIM E(21)
2001 DIM F(21)
2002 FOR D=1 TO 21
2003 LET E(D)=0
2004 LET F(D)=0
2006 NEXT D
```

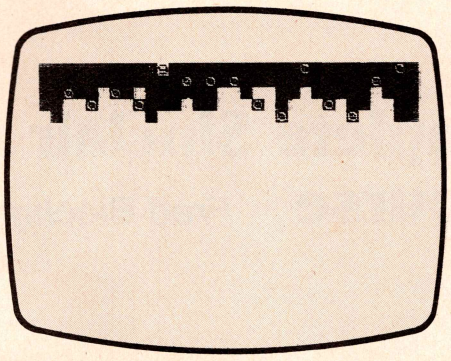
Listing 5.

```
2000 DIM A(200)
2001 FOR B=0 TO 9
2002 FOR C=0 TO 19
2003 LET M=20*B+C
2004 LET A(M)=0
2006 IF B=0 OR B=9 OR C=0 O
R C=19 THEN LET A(M)=61
2008 NEXT C
2010 NEXT B
```

8K ROM
1K RAM

Space Taxi

Neil Dewhurst



You are the pilot of a space taxi in the year 2081. You have just picked up a fare who must catch the next ship to Zeta Chi LXXXI. Naturally, there is a big tip if you make it in one piece. You control your taxi by the 6 and 7 keys to avoid the buildings and the other traffic (which appears to be standing still because you are going so fast). If you crash before getting to the spaceport, the space odometer will show how many blocks you passed before the crash.

Type in the program and then SAVE it before playing. After SAVEing, hit SLOW and ENTER. Your taxi is immediately underway. So be prepared to drive with the 6 and 7 keys.

Graphics note:
Line 60: inverse space.
Line 150: inverse graphic on M.
Line 1010: inverse space.
Line 1030: inverse O.

Neil Dewhurst, 2 Chesterbrook, Ribchester, Nr. Preston PR3 3XT, U.K.

```
 10 LET S=0
 20 LET Y=2
 30 LET X=0
 40 CLS
 50 GOSUB 1000
 60 PRINT AT Y,X;"■"
 70 LET D=0
 80 IF INKEY$="7" THEN LET D=-1
 90 IF INKEY$="6" THEN LET D=1
100 LET S=S+1
110 LET X=X+1
120 IF X=31 THEN GOTO 30
130 LET Y=Y+D
140 IF Y<1 THEN LET Y=1
150 PRINT AT Y,X;"■"
160 PRINT AT Y,X+1;
170 IF PEEK (PEEK 16398+256*PEE
K 16399)=128 THEN GOTO 60
180 PRINT S
190 INPUT J$
200 RUN
1000 FOR J=0 TO 31
1005 FOR I=1 TO 2+INT (RND*4)
1010 PRINT AT I,J;"■"
1015 NEXT I
1020 NEXT J
1025 FOR I=1 TO 15
1030 PRINT AT INT (RND*5)+1,I*2;
"■"
1035 NEXT I
1040 RETURN
```

NEW! ZX81 16K RAM NEW!

BLACKJACK*MASTER by R.A.Foley
Up to 7 Players with "casino" options like Double Down, Split Pairs, Surrender, Sit Out, and more! Don't settle for less.

FOOTBALL FORECASTER by G.Smith
Get this one QUICK as the data base is for the 82-83 season. Specify COLLEGE or PRO version. Money Order gets rush delivery.

REVERSI by Peter Ulrich
2 Players, 1 against the ZX, OR make it play itself. Fast MC moves + optional RATED list of possible moves. "A#1" version!

$19.95 ea.+ 2.50 for the order. Each ZETA Program is shipped on a certified cassette tape with informative booklet. Catalog sent with order or write:

ZETA SOFTWARE
PO BOX 3522/GREENVILLE, SC 29608

PREMIUM DATA CASSETTES
MANUFACTURERS WHOLESALE PRICES

LENGTH	1 CASSETTE	100-PACK	500-PACK
C-10	.59	.54 EA.	.45 EA.
C-20	.66	.61	.53
C-60	.89	.83	.79
C-90	$1.29	$1.21	$1.14

SOFTWARE PUBLISHERS —LET ACTS AUDIO PROVIDE YOU WITH ALL YOUR CASSETTE PRODUCTION REQUIREMENTS.

CUSTOM SOFTWARE DUPLICATION — FOR SINCLAIR, TRS-80, APPLE, ATARI — GUARANTEED TO LOAD.

ACTS AUDIO ALSO SELLS HIGH-SPEED DUPLICATION EQUIPMENT MODIFIED FOR SOFTWARE DUPLICATION.

ACTS AUDIO, INC.
70 WEST ILLIANA AVE.,
ORLANDO, FL. 32806
(305) 423-0338

The Complete Sinclair ZX81 Basic Course

Fred Blechman

The Complete Sinclair ZX81 Basic Course. Published by Beam Software, U.K. and Australia. 255 pages; softbound with two hole punched pages and two rings. In U.S. available from Softsync for $35; two program cassettes, $5.

It has been said, 'It's not what something costs that counts; it's what it's WORTH!' That certainly seems true in the case of *The Complete Sinclair ZX81 Basic Course*. You get 255 pages of 8-1/4' x 5-1/2' two-hole punched sheets held together by two rings in a fancy vinyl cover. Thirty-five dollars for this? It looks like a real ripoff!

Further inspection does not help. No author's name is given—just Beam Software, with publishers in England and Australia. Look in the back for an index, and you will not find one. Look in the front for a table of contents, and you find a single page headed 'INDEX.'

First impressions, however, can be deceiving.

The course begins with the assumption that you know practically nothing about computers or programming and holds your hand pretty tightly. If you are a beginner, you should go through each example with your ZX81 at your side. However, later chapters go into depth on some very valuable material for those intending to do significant programming on the ZX81.

Chapter 1 starts with simple programming that a beginner really should be able to follow. This is unlike many so-called beginner's books. Chapter 2 explains simple flowcharting. Chapters 3 and 4 go into arithmetic operations and functions in depth with examples to explain the purpose of various functions while avoiding mathematical theory.

Chapters 5 and 6 do a great job of explaining strings and string functions, including 'slicing' and substring handling. Chapter 7 covers editing with more information than the Sinclair manual. However, it should have gone into more depth since efficient editing can be a real time-saver in programming. Chapters 8 and 9 explain loops and conditional statements well. Chapter 10 covers arrays, both simple and string. This is a subject of immense importance in the ZX81 since READ/DATA are not provided.

Chapters 11 through 15 cover subroutines, character codes and graphics, FAST and SLOW operation, screen formatting, graphic layout, INKEY$, and PAUSE.

Chapter 16 describes procedures for using a cassette recorder to store and retrieve programs, and Chapter 17 discusses a programming method known as "top down programming." Chapter 18 has an excellent discussion of debugging programs along with expanded explanations of what the 15 ZX81 errors codes really mean.

Chapters 19 through 22 get into the high ground of memory saving techniques, machine code programs, system variables, and advanced graphics. These chapters are definitely not for beginners, but greatly increase the value of this book for non-beginners. PEEK, POKE, and USR are illustrated with line renumber and memory-size machine language programs cleverly hidden in REMark statements at the beginning of a Basic program. The various system pointers are discussed in sufficient detail to help you understand the very peculiar goings-on "under the hood," including the wild antics of the elastic display file of the 1K ZX81. For those schooled in a different memory access, such as the TRS-80, this will be a real education! These chapters are just loaded with information either not available or well-hidden in the Sinclair Manual.

The three appendices include the standard 255 character set with all keywords, a priority listing for program operations, and several application programs that implement the techniques described in the book.

The last 78 pages are a reference manual of all 64 ZX81 keywords, with a page or more of explanation devoted to each. For beginners and those not acquainted with some of the peculiarities of Sinclair 8K Basic, these pages are a treasure that can save a great deal of time and avoid much frustration, especially in translating programs from other Basics. This section alone may be worth the price of the book.

Two cassettes, containing 18 programs from the book, are available separately. They loaded and ran perfectly. This saved a great deal of keyboard and debugging time.

If you have any interest in learning to program your ZX81, especially if you are new in computing, I would recommend this course highly. If you are already a user, you probably do not need it. Instead you might buy ready-to-go programs and just enjoy!

Fred Blechman, 7217 Bernadine Ave., Canoga Park, CA 91307.

ZX81 VIDEO INVERTER ADDS PROFESSIONAL TOUCH.
NO MORE EYE-STRAIN.
DISPLAY SHARP WHITE CHARACTERS ON SOLID BLACK BACKGROUND TV SCREEN.
A TOGGLE SWITCH LETS YOU CHOOSE BETWEEN NORMAL AND REVERSE.
THE SMALL PRINTED CIRCUIT BOARD FITS INSIDE YOUR ZX81.
ALL FULLY TESTED WITH CONCISE INSTRUCTIONS.
MONEY BACK GUARANTEE.
AVAILABLE AS KIT £5 / $10
READY BUILT £6.50 / $ 13
PRICES INCLUDE AIRMAIL. SEND £ OR $ CHECK.
D. FRITSCH
6 STANTON ROAD
THELWALL
WARRINGTON
CHESHIRE
WA4 2HS
UK

SAVE YOUR MEMORY! AND YOUR MONEY!

Battery backup unit for ZX80/81. This inexpensive unit lasts for 30 minutes on standard "D" cell batteries, protecting your valuable programs from glitches and power failures. Requires at least a 9 volt power supply (like Sinclair's) and 6 "D" cells (not included).

Only $12.95

VOCAB BUILDER for ZX81 16K 60 words per cassette, for teens and adults $9.50

Send check or money order to:

CSI COMPANY
132 E. PASCO LANE
COCOA BEACH, FLA 32931

ZX81 Chess vs. ZX Chess II

Martin Wren-Hilton

SOFTWARE PROFILE

Name of Package: ZX81 Chess.
ZX Chess II.

Type: Board Games

System: Sinclair 8K ROM; 16K RAM

Format: Cassette

Summary: Two powerful chess programs

Price: ZX81 Chess: £9.50.
ZX Chess II: £15.00

Manufacturer:
(ZX81 Chess)
Micro-Gen
24 Agar Crescent
Bracknell, Berkshire, U.K.

(ZX Chess II)
Artic Computing
396 James Reckitt Ave.
Hull, North Humberside, U.K.

Computer chess is becoming a very popular hobby for those who cannot find opponents on their level, and a large number of "dedicated" machines are appearing with increasingly greater strengths. Another area of growing popularity is designing a chess program which is more powerful (i.e., a better player) than other chess programs. Two powerful chess programs are now available for the 16K ZX81: *ZX81 CHESS* by Micro-Gen and *ZX CHESS II* by Artic Computing.

Both programs are supplied on cassette with detailed instructions. *ZX81 CHESS* has six levels of play; *ZX CHESS II*, seven. Both games set up a board and use the standard notation with rows 1 to 8 going up and A to F going left to right. *ZX CHESS II* also shows the letters of the columns and the numbers of the rows on the screen for quick reference when entering a move. The 24x24 board of *ZX CHESS II* is somewhat easier to use than the 16x16 board of *ZX81 CHESS*. The pieces are represented as follows: K King, Q = Queen, R = Rook, B = Bishop, N = Knight and I = Pawn. Black pieces are shown as black on white and white pieces as white on black.

Martin Wren-Hilton, 4 Little Poulton Lane, Poulton-le-Fylde, Blackpool FY6 7ET, U.K.

Entering your move is simple on both programs. For example, to move a piece from position E2 to E4 you would enter E2-E4 on *ZX CHESS* and E2E4 on *ZX CHESS II*.

(Continued on p. 84.)

Figure 1: A Game between ZX81 Chess and ZX Chess II

	ZX81 Chess	ZX Chess II
01	D2-D4	G8-F6
02	B1-C3	D7-D5
03	C1-F4	C8-F5
04	G1-F3	E7-E6
05	F4-G5	B8-D7
06	A2-A4	F8-D6
07	H2-H4	E8-G8
08	E2-E3	H7-H6
09	G5XF6	D8XF6
10	F1-D3	F5XD3
11	C2XD3	F6-F5
12	E1-G1	C7-C6
13	F1-E1	A8-C8
14	A4-A5	F8-E8
15	A5-A6	B7-B6
16	G2-G3	B6-B5
17	G1-G2	B5-B4
18	C3-E2	H6-H5
19	E1-H1	D7-F6
20	D1-C2	F6-D7
21	B2-B3	C6-C5
22	E2-F4	C5XD4
23	C2-E2	D4XE3
24	E2XE3	D6XF4
25	E3XF4	F5XD3
26	F4XB4	D7-C5
27	B4-D2	D3XB3
28	D2-G5	G7-G6
29	H1-B1	B3-D3
30	B1-D1	D3-C4
31	D1-D4	C4-B5
32	D4-F4	C5XA6
33	F4-A4	A6-B4
34	A4XA7	B4-C2
35	A1-A5	B5-B4
36	A5-A4	B4-C5
37	A7-A5	C5-C3
38	A5-A7	C8-C4
39	A4XC4	D5XC4
40	F3-E5	C2-E1
41	G2-G1	C3XE5
42	G5XE5	E1-F3
43	G1-F1	F3XE5
44	A7-A5	E5-D7
45	F1-G2	C4-C3
46	A5-G5	C3-C2
47	G5XG6	F7XG6
48	F2-F3	C2-C1
49	G2-F2	C1-D2
50	F2-G1	D2-E3
51	G1-G2	E3-E2
52	G2-H3	E2XF3
53	H3-H2	G8-H7
54	G3-G4	F3XG4
55	H2-H1	G4-H3
56	H1-G1	H3XH4
57	G1-G2	H4-F4
58	G2-H3	F4-G5
59	H3-H2	H5-H4
60	H2-H1	H4-H3
61	H1-H2	G5-G2

list
YOUR SOFTWARE
now for the February catalog
SELL IT—SHARE IT
You made it to fit your specific needs and it will meet the needs of **hundreds of other Sinclair users** who will
ORDER FROM YOU AT YOUR PRICE

software category
☐ Business Applications
☐ Educational
☐ Games
☐ Industrial
☐ Home
☐ Helpful Hints

Special Hardware if needed

designed for
☐ ZX80
☐ ZX 81/Timex Sinclair 1000

minimum of
☐ 1 k ☐ 32 k
☐ 2 k ☐ 48 k
☐ 16 k ☐ 64 k

Brief description (100 characters max.)

Available as
☐ Cassette $ _____ (US)
☐ source list $ _____ (US)

Name _____
Address .....
Street & # .....
State/Prov _____
Zip/Postal code .....

☐ Listing(s)
$10: 5£ per listing .00
☐ Purchase ___ copy(s)
Sinclair Software
Sourcebook ($8/4£ ea) .00
☐ Check or Money order
☐ Visa or Mastercharge
_____
exp___/_____ TOTAL _____

Drivers Software Sourcebooks
PO Box 1048 Port Hardy
British Columbia, Canada,
VON-2PO

House of Horrors

Douglas Duchene

You are trapped in the dreaded "House of Horrors." Naturally it is filled with monsters, mummies, skeletons, and strange creatures. Secret passages and mysterious rooms confront you with danger and yet offer the only way out. Your goal is to escape from the house alive.

As you move through the rooms, you find various items to help you survive, but you do not know exactly what they will be. So you must depend upon your wits, memory, and logic to escape.

The full House of Horrors program requires somewhat over 2K RAM. As a result, it is split into two sections. Type in Listing 1 and SAVE it. Do not kill the program, but enter the changes in Listing 2 and SAVE the program again. Now LOAD Listing 1 from your tape and RUN it. This part of House of Horrors fits into 2K RAM. It can be played as a game in itself for those who have only 2K RAM, and it is a segment of the game for those who have enough memory for the lower level. When the prompt "READY CASSETTE" appears on the screen, you have reached the end of the game if you have only 2K RAM.

However, if you have more RAM, set the tape at the beginning of Listing 2, hit NEWLINE, and press the play button on your tape recorder. When the LOADing is finished, press RUN and NEWLINE to continue your efforts to escape.

While the program was written for the 4K ROM, it should not be difficult to translate to 8K ROM. This will require changing the PEEK addresses, the array subscripts, some of the character codes, logical expressions, and the TL$ function, e.g., 310 would become LET R$=R$(2 TO).

For users with enough memory the game can be made more complex by increasing the number of rooms and items available.

Douglas Duchene, Lot 59 Gatewood, Greenwood, SC 29646.

Listing 1. The House of Horrors (Upper Level).

```
  10 REM 1728630UTSIDE,KITCHEN,B
AR,LIVING ROOM,DINING ROOM,PIT,L
IBRARY,BEDROOM,HALL,KNIFE,SCROLL
,WINE,KEY,BOOK,ROPE,GO RUNWALCLI
JUMGETTAKDROLEALOOOPEREADRIINVSH
A
  20 DIM I(5)
  30 FOR J=0 TO 5
  40 LET I(J)=PEEK(J+16427)-28
  50 NEXT J
  60 PRINT "HOUSE OF HORRORS"
  70 PRINT
  80 LET R=0
  90 PRINT "YOU ARE ";
 100 IF R THEN PRINT "AT THE ";
 110 LET X=7
 120 LET Q=R
 122 LET P=16432
 124 GO SUB 9000
 130 PRINT
 140 PRINT "ITEMS HERE:"
 145 LET F=0
 150 FOR Q=0 TO 5
 160 LET P=16501
 165 LET Z=R
 170 LET X=5
 175 IF F=1 THEN LET Z=0
 180 IF I(Q)=Z THEN GO SUB 9000
 190 IF I(Q)=Z THEN PRINT
 200 NEXT Q
 210 PRINT ":"
 220 INPUT R$
 230 CLS
 240 LET P=16534
 250 FOR J=1 TO 15
 260 IF CODE(R$)=PEEK(P) AND COD
E(TL$(R$))=PEEK(P+1) AND CODE(TL
$(TL$(R$)))=PEEK(P+2) THEN GO TO
 310
 270 LET P=P+3
 280 NEXT J
 290 PRINT "I DONT UNDERSTAND"
 300 GO TO 210
 310 LET R$=TL$(R$)
 320 IF R$="" OR CODE(R$)=0 THEN
 GO TO 330
 325 GO TO 310
 330 LET R$=TL$(R$)
 340 GO TO (J+3)*100
 400 LET Z=1
 410 IF R$="N" OR R$="S" THEN LE
T Z=3
 420 IF R$="W" OR R$="N" THEN LE
T Z=Z*-1
 430 IF R$="N" OR R$="S" OR R$="
E" OR R$="W" THEN GO TO 460
 440 PRINT "N:S:E:W"
 450 GO TO 210
 460 IF R+Z<9 AND R+Z>0 THEN GO
TO 490
 470 PRINT "THERE IS NO WAY TO G
O ";R$
 480 GO TO 210
 490 LET R=R+Z
 495 GO TO 90
 800 GO TO 400
 900 GO SUB 1900
 905 IF NOT I(J)=R THEN GO TO 19
70
 910 LET I(J)=0
 920 PRINT "OK."
 930 GO TO 210
1000 GO TO 900
1100 GO SUB 1900
1110 IF NOT I(J)=0 THEN GO TO 21
0
1115 LET I(J)=R
1120 GO TO 920
1200 GO TO 1100
1300 GO TO 90
1400 PRINT "I CANT"
1410 GO TO 210
1500 IF R$="SCROLL" OR R$="BOOK"
 THEN GO TO 1510
```

Build your own computer for $79.95

The Sinclair ZX81 personal computer kit

Imagine building your own computer for only $79.95!

That's exactly what you can do with the ZX81 kit. It comes with all the parts you need and complete diagrams and instructions for putting it together. All you have to supply is soldering iron, solder, and a screwdriver. Plus, of course, a little bit of work.

But you get a lot more than several hours of kit-building fun. You also get a surprisingly powerful personal computer. The ZX81 hooks up to any TV for a 32-character by 24-line display (we provide the connecting cables). You can also use a standard cassette recorder to store your programs (again, we provide the cables).

Most important, you get a BASIC programming language that's powerful enough to challenge and interest the most experienced programmers. The ZX81 can handle multidimensional string and numerical arrays. It has full mathematical functions accurate to eight decimal places. Single-key entry for every command. Syntax error detection, debugging codes, and easy editing. Plus features that are ideal for creating games, such as 20 graphic symbols, continuous display, and random number generator.

The ZX81 can be expanded too. You can increase the memory from 1K to 16K with our Memory Module for $49.95. And you get a comprehensive manual that completely documents the capabilities of the ZX81, and teaches programming from the ground up.

In short, you get all the features that have made the Sinclair ZX81 the fastest selling personal computer in the world. And you get the satisfaction and fun of building it yourself.

A few years ago, this kind of computer power was simply unavailable to the individual. Even today, most personal computers are too expensive to buy for personal use.

But the ZX81 kit can be yours for only $79.95. Take advantage of this unique offer today. To order, send the coupon along with a check or money order. Or for faster delivery, call our toll-free number and use your MasterCard or VISA.

To order call toll free: 800-543-3000.

Ask for operator #509. In Ohio call: 800-582-1364; in Canada call: 513-729-4300. Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your MasterCard or VISA ready.

These numbers are for orders only. If you just want information, please write: Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

AD CODE 09SYOK

MAIL TO: Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

	PRICE*	QTY.	AMOUNT
ZX81 Kit	$79.95		
16K Memory Module	$49.95		
Shipping and Handling	$4.95		$4.95
*U.S. dollars		TOTAL	

Name

Address

City State Zip

Sinclair technology is also available in Timex/Sinclair computers under a license from Sinclair Research Ltd.

sinclair

```
1505 GO TO 1400
1510 IF R$="SCROLL" AND I(1)=0 T
HEN PRINT "IT SAYS ESCAPE BY THE
 PIT"
1520 IF R$="BOOK" AND I(4)=0 THE
N PRINT "IT SAYS MAGIC WORD (SHA
ZAM)"
1530 IF (R$="SCROLL" AND I(1)=0)
 OR (R$="BOOK" AND I(4)=0) THEN
GO TO 210
1540 PRINT "YOU DONT HAVE IT"
1550 GO TO 210
1600 IF I(2)>0 THEN GO TO 1540
1610 IF R$="WINE" THEN GO TO 200
0
1620 PRINT "YOU CANT DRINK ";R$
1630 GO TO 210
1700 PRINT "YOU ARE CARRYING:"
1710 LET F=1
1720 GO TO 150
1800 PRINT "POOF YOU APPEAR IN T
HE PIT"
1810 PRINT "READY CASSETTE?"
1820 INPUT R$
1830 LOAD
1900 LET P=16502
1910 FOR J=0 TO 5
1920 IF CODE(R$)=PEEK(P) AND COD
E(TL$(R$))=PEEK(P+1) THEN RETURN

1930 LET P=P+1
1940 IF NOT PEEK(P)=216 THEN GO
TO 1930
1950 LET P=P+1
1960 NEXT J
1970 PRINT "I SEE NO ";R$;" HERE
"
1980 GO TO 210
2000 PRINT "IT WAS POISON"
2010 PRINT "YOU ARE DEAD"
2020 STOP
9000 FOR J=0 TO X
9010 IF J=Q THEN GO TO 9050
9020 LET P=P+1
9030 IF NOT PEEK(P)=216 THEN GO
TO 9020
9040 NEXT J
9050 LET P=P+1
9060 IF PEEK(P)=216 THEN RETURN
9070 PRINT CHR$(PEEK(P));
9080 GO TO 9050
```

Listing 2. The House of Horrors (Lower Level Extension).

```
  10 REM 137637,PIT PASSAGE,CRYP
T,MAZE,TUNNEL,EMPTY ROOM,TREASUR
E ROOM,LAVA PIT,SWORD,KEY,CHEST,
DOOR,MUMMY,SKELETON,GO RUNWALCLI
JUMGETTAKDROLEALOOOPEKILXXXINVXX
X
  60 PRINT "ALL YOUR ITEMS ARE G
ONE"
  80 LET R=1
  90 IF R=8 THEN GO TO 2000
  91 PRINT "YOU ARE#";
 110 LET X=8
 122 LET P=16432
 160 LET P=16497
 240 LET P=16534
 332 IF NOT J=12 AND ((R=3 AND I
(4)>0) OR (I(5)>5 AND R=7)) THEN
 GO TO 350
 350 PRINT "MONSTER WONT LET ME"
 360 GO TO 216
 908 IF J>2 THEN GO TO 1130
1130 PRINT "ARE YOU CRAZY?"
1140 GO TO 210
1470 IF R$="DOOR" AND I(1)=0 THE
N GO TO 3000
1480 IF R$="DOOR" OR R$="CHEST"
AND I(1)>0 THEN PRINT "I CANT"
1490 IF R$="CHEST" AND I(1)=0 TH
EN PRINT "ITS EMPTY"
1495 GO TO 210
1500 IF R$="ME" THEN GO TO 2010
1505 IF I(0)>0 THEN GO TO 1580
1510 IF R=3 AND R$="MUMMY" THEN
LET I(4)=-1
1520 IF R=7 AND R$="SKELETON" TH
EN LET I(5)=-1
1530 GO TO 210
1580 PRINT "WITH WHAT MY HANDS?"
1585 PRINT "IT ATTACKED YOU"
1590 GO TO 2010
1900 LET P=16498
2000 PRINT "YOU FELL IN"
3000 PRINT "YOU HAVE ESCAPED"
3010 STOP
```


"THE RIGHT STUFF"
ZX-81/TIMEX SINCLAIR 1000 16K
GAMES ON QUALITY CASSETTES

"BAC-TRAC"
A "PACMAN" STYLE PACKAGE OF
FUN. 36 GAME VARIATIONS.

"FLIPS"
A TWO-DIMENSIONAL VERSION OF
"RUBIC'S CUBE." FULL SCREEN
WITH 99 LEVELS.

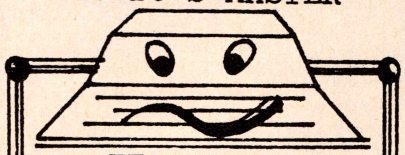
"ARMEGON"
DEFEND YOUR FORTRESS
AGAINST THE INVADING ZARDAX.
10 LEVELS OF PLAY.

"SUB SEARCH"
LOB DEPTH CHARGES AT THE
RELENTLESSLY ADVANCING
SUBMARINES. MULTI LEVELS OF
PLAY.

"BREAK-OUT"
SINCLAIR VERSION OF THIS
TRADITIONAL FAVORITE. MULTI
LEVELS OF PLAY.

ONLY $6. FOR ANY CASSETTE
WRITE:
THE LAMB'S SOFTWARE
1469 AAL BORG WAY
SOLVANG, CA. 93463

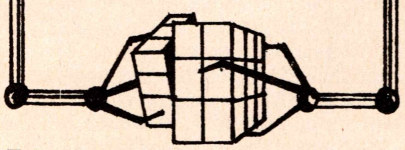
RUBIC'S MASTER



FEATURES:
Use as Normal Cube
Enter User's Cube
Scrambles Cube
Solves Cube
Save Current Cube

For ZX80;8K ROM, ZX81
16K RAM Required
On Tape with
Instructions

JEU INTELLIGENT
P.O. Box 71
Glasgow, VA 24555
Price $15 Add $2 for
orders outside U.S.



If You Can't Solve It
I CAN.

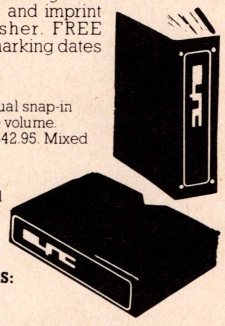
SHELF CONSCIOUS?

Now you can organize your copies of
SYNC

Now your magazines can be a handsome addition to your decor, well organized, and easy to find, thanks to these durable library-quality cases or binders. They're made of luxury-look leatherette over high-quality binder board. And both styles are custom-designed for this or any other magazine you save, with size, color and imprint selected by the publisher. FREE transfer foil included for marking dates and volumes.

Magazine binders
hold a year's issues on individual snap-in rods, combining them into one volume. $7.95 each; 3 for $22.50; 6 for $42.95. Mixed titles OK for quantity prices.

Open-back cases
store your issues for individual reference. $6.95 each; 3 for $19.75; 6 for $37.50. Mixed titles OK for quantity prices.



For faster service,
CALL TOLL-FREE 24 HOURS:
800-345-8112
(In PA only: 800-662-2444.)

Sync
P.O. Box 5120, Philadelphia, PA 19141
Please send: ☐ Cases ☐ Binders

TITLE	QUANTITY
Sync	
Other:	

☐ **PAYMENT ENCLOSED $**_____ * Add $1.00 *per order* for postage and handling. Outside USA add $2.50 *per unit* ordered; send US funds only.
☐ **CHARGE** (Minimum $10): ☐ American Express ☐ MasterCard ☐ Visa

Card No._____ Exp. Date_____
Signature_____
Print Name_____
Address_____
City/State/Zip_____
*Residents of PA add 6% sales tax.

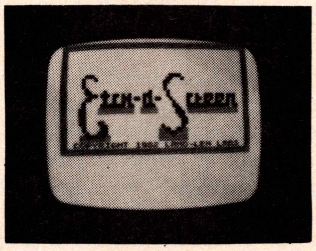
WORKS WITH ALL MEMORY SIZES!

FOR THE TIMEX-SINCLAIR 1000, ZX81, (AND ZX80 WITH 8K ROM)!

THE ZX81 HOME COMPUTER PACKAGE

ETCH-A-SCREEN

Easily paint pictures anywhere within the top 17 rows. A moving cursor travels up, down, right, left, even diagonally, leaving behind text, graphics, and inverse characters. Keys REPEAT while held down. Your drawing can be stored on tape... and immediately appears when reloaded. Perfect for designing screen logos, or just doodling on the screen

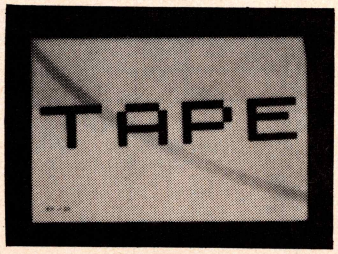


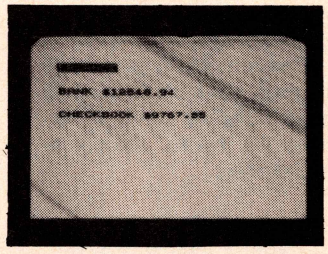
BILLBOARD

Use BILLBOARD for messages, displays, and exhibits. Type in a message of up to 250 letters, and press ENTER. A row of giant letters moves smoothly across the screen, repeating your message until you press NEW and enter a new message. Or, press SAVE and store the message on tape. When reloaded, the message begins automatically.

CHECKBOOK BALANCER

Keep a running tabulation of your bank account. CHECKBOOK BALANCER displays your current checkbook balance, (up to $59,999.99), your latest account balance, and a list of up to 22 transactions which haven't cleared the bank. A plastic-coated keyboard overlay defines ENTER, VOID, CLEAR, and DISPLAY keys. And a SAVE key stores the updated program on tape.





COMPOSER

A keyboard overlay transforms your computer into a four-octave musical instrument which broadcasts music as the keyboard is played. Listen to the music through a radio placed beside the computer, or through an amplifier and speakers. Or record the music directly onto tape. The last 175 notes played are stored in memory, and can be played back or edited. EDIT keys let you change notes and single-step forward or backward through the piece. SPECIAL EFFECTS keys are used to create unusual sound effects like laser blasts and arcade noises.

The complete ZX81 HOME COMPUTER PACKAGE, including cassette of four programs, manual, guide cards, screen display sheet, musical score sheet, and TWO FULL-COLOR KEYBOARD OVERLAYS, is just $9.95. Shipping and handling included! **$9.95**

From: LAMO-LEM LABORATORIES, CODE209, BOX 2382, LA JOLLA, CA 92038

For the ZX81, TIMEX-SINCLAIR 1000, and 8K ROM ZX80 or MicroAce

ITEM	PRICE	QTY
ZX81 HOME COMPUTER PACKAGE	$9.95	
ZX81 CLASSICS	$9.95	
ZX81 DISASSEMBLER	$9.95	
TOTAL		

NAME _____

ADDRESS _____

CITY _____

STATE/ZIP _____

Our catalog, with screen display and coding sheets, is free!

SINWARE announces

Z EXTRA

An original new graphics control program for the ZX81 or TS1000.

Z EXTRA gives you fast machine-language control of all the standard ZX graphics and display features direct from the keyboard. No programming required to create, save, print or display screen after screen of text and graphics. **Z EXTRA** features blinking cursors, repeating keys, four write directions, eight plot directions, 4×4 and 8×8 character sizes, insert, delete and many other convenient functions for creating screen displays.

Easy menu selection of single-stroke commands to save multiple screens to tape or in print, display them in sequence or in scrolls, revise, reorder or search for data entries.

Z EXTRA turns your ZX81 into an electronic notebook with a stretch of screen space as long as your memory (RAM). Use it for free-form lists, formatted data files, data displays, moving billboards, etc.

Z EXTRA requires a ZX81 or TS1000 with at least 16K of RAM and is especially useful with 64K. Just $19.95 on cassette.

HOT Z is an easy-to-use disassembler/-editor and machine-language monitor that gives your ZX computer the speed and response of a Z80 hot rod. Special entry modes take the tedium out of hex code entry. Extensive debugging facilities let you track down errors fast. Cursor-driven editing functions simplify corrections and revisions. Labels let you create annotated listings of RAM or ROM contents that stay understandable.

HOT Z now runs your ZX printer as well as the cassette for full documentation of your machne-code routines.

HOT Z's detailed instructions are ideal for the beginner or part-timer.

HOT Z is available for ZX80 or 81, in versions for 16K or 32K+. Please specify. Only $19.95 on cassette.

SINWARE
BOX 323, DIXON, NM 87527

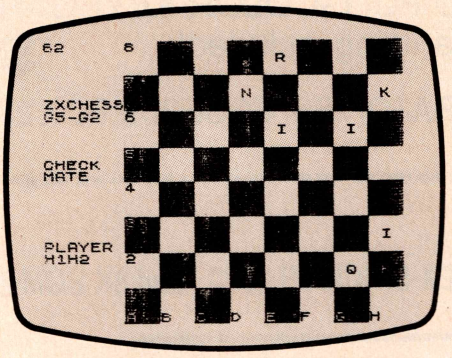
ZX Chess vs. ZX Chess II, Continued...

Both games make use of the En Passant privilege and display the move as PXPEP (pawn exchange pawn, En Passant). Castling is shown as 0-0 or 0-0-0 depending on the side. If you want to castle, you must enter the king's move. You cannot castle out of check, and both programs stop and report invalid moves.

Both allow you to change sides, adjust the level of play, and alter some of the pieces half way through the game.

There are some differences. *ZX CHESS II* allows you to save the present board set-up on cassette, to COPY the screen onto the printer, and to print all the moves that have taken place in that game on the printer. On the higher levels you can even ask it to recommend your next move.

As a test to see which was the better chess player, I decided to pit them against each other. I chose level two on both. On this level *ZX81 CHESS* takes about a minute to decide its move while *ZX CHESS II* takes about forty seconds. A toss of a coin decided that *ZX81 CHESS* should go first. Chess enthusiasts will enjoy analyzing the match move by move. The final result was that *ZX CHESS II* won convincingly, with a Queen, a Rook, a Knight and two Pawn advantage! The final position of the pieces is shown in Figure 1.



Both games have levels for all players from beginner to postal chess. *ZX CHESS II* is clearly a better player and has more features than *ZX81 CHESS*, but it does cost £5-00 more. If you have a QS Character Board, there is a modified version of *ZX CHESS II* which shows real full-size pieces graphically, and very impressive it is, too. ■

BACK ISSUES OF SYNC

Add to your *Sync* collection today, while copies are still available. The more complete your library of back issues, the more authoritative and useful it will be to you.

The earliest available issue is January/February 1981. Order any issues you wish, being sure to specify the month and year for each. If a particular issue is out of stock, your payment will be refunded promptly.

Back issues of *Sync* are priced at $4.00 each, postpaid. Outside the U.S.A., $5.00 each.

SYNC
Dept.NAZS, 39 E. Hanover Ave., Morris Plains, NJ 07950
Please send volumes of *Sync* listed below:

Mo. & Yr.	Quantity	Unit Price	Total Price

PAYMENT ENCLOSED $_____.
(NJ residents add 5% sales tax.)

Mr.
Mrs.
Ms._____
(please print full name)
Address_____
City_____
State/Zip_____

16k Games
(LISTINGS)
★★ **Just $3** ★★

SACK MAN

Travel through the maze and pick up points. But watch out for the ghosts!

NAVAL COMMAND

Seek and destroy the enemy ships.

KOALA SOFTBEAR

$3.00 each
Only $5.00 for both!

1455 Canora, Mt Royal
Qué, Canada. H3P 2J7

4K ROM; 1K RAM
8K ROM; 2K RAM

A Mouthful for Every Occasion

Don R. Day

You can call up sensational headlines, forceful commands, whimsical statements, ageless wisdom, and irrelevant nonsense all at the push of a key on your Sinclair computer with the Mouthful program.

What the Program Does

Mouthful is a simple text manipulation program based on the old game of drawing words randomly from a list of assorted words. Strung together, the words make up an unpredictable and often hilarious phrase or saying.

By using the Sinclair computer in a unique way, Mouthful plays this old game in a new way. The program chooses a word from each of the three word lists (see Tables 1, 2, and 3) and prints the resulting phrase on your TV screen. You can generate new phrases as often as you please by pressing NEWLINE.

Don R. Day, 980 West McFie, Las Cruces, NM 88001.

How to Use the Program

The program for Mouthful is in Listing 1. Type it into the computer carefully.

To begin the operation of the program, type GO TO 20 and hit NEWLINE. If the program is running properly, a string prompt ("L") will appear in the upper left corner of the screen.

Now comes the big decision: What list will produce the phrase you want? Select Table 1 for oddball headlines, Table 2 for zany slogans, Table 3 for high-sounding

Listing 1. Mouthful (4K ROM).

```
 10 GO TO 1ØØ
 20 DIM A(15Ø)
 30 INPUT A$
 40 FOR N=Ø TO 149
 50 LET A(N)=CODE(A$)
 60 LET A$=TL$(A$)
 70 NEXT N
100 CLS
110 PRINT "PRESS N/L TO GENERAT
E PHRASE"
120 INPUT A$
130 PRINT
140 PRINT
150 PRINT
160 PRINT
170 LET N=Ø
180 GO SUB 3ØØ
190 PRINT "#";
200 LET N=1
210 GO SUB 3ØØ
220 PRINT "#";
230 LET N=2
240 GO SUB 3ØØ
250 PRINT
260 PRINT ,"AGAIN? (Y/N)"
270 INPUT A$
280 IF NOT A$="N" THEN GO TO 1Ø
Ø
290 STOP
300 LET I=RND(4)-1
310 FOR M=Ø TO 9
320 PRINT CHR$(A((N*4Ø+I*1Ø)+M)
);
330 NEXT M
340 RETURN
```


INCREASE YOUR ZX81 PROGRAMS WITH INFINITY
4 K or more

BOUNCY Entrapped by the mad scientist, Count Von Der Bouncy, it is up to you to fight off his bizarre creations known as snogel balls and try to regain your freedom.
$7.95*

NIGHT DRIVER Test your driving skills on a desert road. Through difficult turns and blinding curves, find out how good you really are.
$7.95*

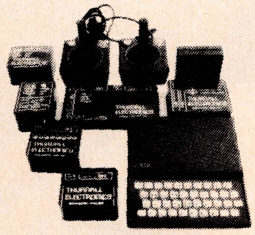
CASINO/STOCKMARKET Now you can play the slot machines, keno, roulette, blackjack, and more right in your own living room/then see how well you can deal in the stock market. Be a millionaire in one night.
$9.95*

MISSILE STRIKE Defend against enemy missiles & satellites seeking to destroy innocent cities. You are the commander of a land-based missile defence center. The fate of the world lies in your hands.
$7.95*

***(All orders should include $1 for postage and handling. Out of the U.S., include $2 for postage and handling.)**

California residents, please add 6½% sales tax.

Infinity Research Development
845 Via de la Paz, Suite A120
Los Angeles, Ca. 90272



ZX81 OWNERS

SPECIALISED PRODUCTS MODULAR EASY TO USE FOR HOME/INDUSTRY & EDUCATION

TE10 INPUT/OUTPUT PORT – Easy to use. Fits between ZX & RAM PACK/PRINTER (if required). No skill required to connect. Can be used for such things as:– motor control; sound/music generators, connection to printers/floppy discs/light pens/other computers, temperature monitoring, square wave generating, control of rotating aerials, even train sets etc. Port has 16 programmable 1/0 lines and may be used without any electronics knowledge to connect other add-ons. Motherboard required ONLY when two or more add-ons are used at any one time.
FULLY ASSEMBLED **$29.50**
KIT (WITHOUT CASE) **$24.50**
TE12 4 CHANNEL RELAY BOX – To suit Port Contact rating:– 240v AC/1,5A – 24V DC or 110V AC/3A. Up to 4 units i.e. 16 relays can be operated **$24.50**
TE15 8 WAY TRANSISTOR DRIVER – **$16.50**
TE17 8 WAY SWITCH UNIT (EDUCATIONAL) – **$21.50**
TE18 8 WAY INDICATOR UNIT (EDUCATIONAL) – **$21.50**
TE20 JOYSTICK & FREE GAME – (2 Joysticks may be connected via Motherborsd.) **$21.50**
TE30 MOTHERBOARD – Allows multiples combinations of add-ons – up to 16 1/0 lines may be used – **$26.50**
NOTE: TE 12/15/18 Require 9V. 300mA Calculator Type Power Supply
23 + 23 WAY ZX Edge Con **$5.00**
16 WAY SINGLE SIDED EDGE CON **$3.50** EXTENDED PIO NOTES **$2.50**
PRICES INCLUDE POSTAGE

Receipts always provided: – Delivery normally ex-stock. ADD Full instructions and examples with all products.
Send for catalog $1.00. Mastercharge/Visa accepted.
SEND S.A.E. FOR CATALOGUE. TELEPHONE ORDERS ACCEPTED.
DISTRIBUTOR INQUIRIES INVITED

VISA
THURNALL (ELECTRONICS) ENG.
DEPT Y, 95 LIVERPOOL ROAD, CADISHEAD, MANCHESTER M30 5BG
TEL: 061-775 4461 (24 hour)

utterances known as aphorisms (e.g., Necessity is the mother of invention).

Type in the list you have selected. Be careful to observe the spaces needed to pad the words into a ten character field. Press NEWLINE after the last word. This stores the words in a single array with proper spacing for random selection. Note that using Table 3 requires some program changes before you type in the list. The screen will go blank for a moment as the ZX80 does its prestidigitation.

The prompt in line 110 will appear and all you need to do is follow the prompts.

You can make up your own lists for the Mouthful program. The list must have exactly 15 words. No word can be longer than 10 letters, and, if the word is shorter, add spaces to fill out to 10 characters.

After you SAVE a program, use GO TO 100 and NEWLINE to begin execution of the program. *Do not use* RUN and NEWLINE or you will lose your list.

The program can be changed to use longer lists if you have more memory. Lists of 30 words or even more can be entered if array A (line 20) is made larger and the limit of I (line 300) is increased.

Table 1. Wacky Headlines.

#COMPUTER#
BANK#CLERK
GOVERNMENT
#COMMITTEE
PROSECUTOR
GENERATES#
NABBED#FOR
ELIMINATES
RECOMMENDS
#CONDEMNS#
HEADLINES#
EXTORTION#
EFFICIENCY
MODERATION
PRISONERS#

Table 2. "Yes, sir!" Slogans.

##CONSUME#
OBLITERATE
#ADVERTISE
##REWARD##
##WELCOME#
HEALTHFUL#
#MENACING#
GANGRENOUS
#LAVENDER#
HONORABLE#
VEGETABLES
INTRUDERS#
HORSEFLESH
BEHAVIOR##
#VISITORS#

Table 3. Words of Wisdom.

For Table 3 change Listing 1 as follows:

```
190 PRINT "#IS THE";
220 PRINT "#OF#"
```

##BEAUTY##
##AVARICE#
#NECESSITY
##HONESTY#
##COURAGE#
##SCOURGE#
INSTIGATOR
##REWARD##
#BLESSING#
#LOATHING#
INVENTION#
HUMANITY##
##APATHY##
DEDICATION
#AMBITION#

Now available in the United States, Britains' best-selling ZX81 workstation is a stylish yet practical plinth which will angle your TV to reduce eyestrain, conceal the leads and power supply, and if you have the 16K RAM it will hold it steady to reduce crashes. Moulded in tough black ABS complete with a ready-wired on/off switch. Looks really great!

Please order from our U.S. Agent-Jim Griner P.O. Box 1 Princeville, ILL 61559.
Manufactured By Peter Furlong, Products Unit 5, South Coast Road Industrial Estate. Peace Haven, Sussex, England Tel: (07914) 81637

GET SMART!

Use Smartware software! We specialize in providing software for 'full-blown' Timex / Sinclair personal computers. Our programs can help you realize the full potential of your machine, for both entertainment and applications.

NEW RELEASES:

1. James Bond Adventure #1 - A unique adventure game, in which you must help 'Agent 007' make the right decisions to complete his mission. Of course, you will travel to exotic places, fight against overwhelming odds, and hopefully save the world.
2. ZX Yahtzee - The classic dice game of strategy and luck, played on a computer. For one to four players.
3. Wharri - Based on an ancient African game that was played with beans and bowls. Now you will need concentration and cunning to outwit the computer.
4. Mailing List / Phone Directory - Store the address and/or telephone number for up to 100 people. Search for entries in a variety of ways.

STANDARD FEATURES:

1. All programs will run on Sinclair ZX81 and Timex 1000 computers with 16K of RAM.
2. Software is shipped on certified error-free data cassettes, with each program recorded twice on the cassette (just in case one copy gets accidentally erased).
3. Instructions are supplied as part of each program, rather than on separate papers which tend to get misplaced.
4. Each program is available on cassette, or in listing form (if you really enjoy typing).

TO ORDER:

Send a check for $9.95 for each cassette, or $4.95 for each listing, to: Smartware, P.O. Box 1491, Melbourne, Florida 32935

How the Program Works

When you press NEWLINE after typing in the list, Mouthful converts the characters into code equivalents which are stored in array A. The trick to breaking this array into three separate lists lies in manipulating the index variable N. This is done by using a multiplier to force N to "see" only that part of the array you want it to. On the first call for a word, the loop index N is set to 0, and a random number is assigned to I. Thus, if I is 3, then the word chosen begins at 0*40 plus 3*10, or at A(30). On the second call for a word, N is set to 1 and I is randomly reassigned. Thus, if I is 5, then the word begins at 1*40 plus 5*10, or at A(90). A third call prints out a random third word by the same technique, and the phrase is finished.

Notes

The following line notes point out some of the program features.

20-70: Load the word lists into the program as a single variable, A$.

100: Starts main portion of program; return point from line 280.

130-160: Help format display.

180, 210, 240: Calls for the random words.

290: End of main portion.

300: Begins subroutine for word selection and printing.

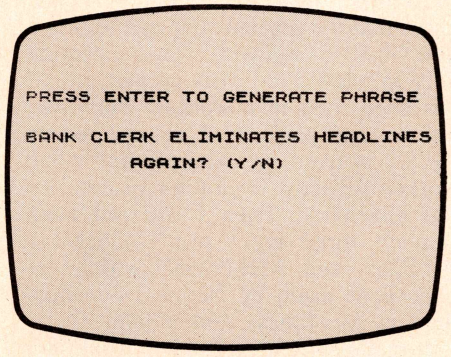
340: Return to main program.

8K ROM Changes

Listing 2 gives the translation for the 8K ROM.

The 8K program can also be made to run continuously by deleting lines 110 to 290 in Listing 2 and substituting lines 110 to 290 in Listing 3.

The 8K ROM version requires over 1K RAM to run as shown; however, the continuously running version can be squeezed into 1K RAM by shortening array A to about 90 elements and adjusting line 320. Short words can be used to maintain the variety of phrasing. ■



So . . .

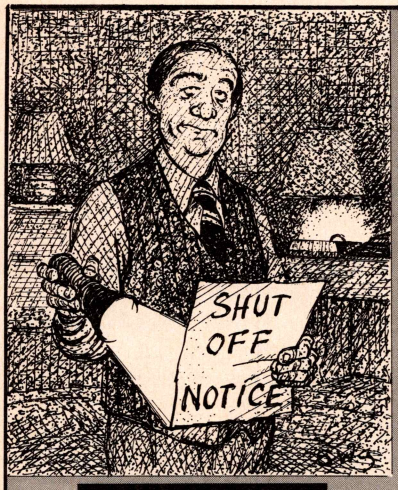
Set this program up and have it running at your next party. Your popularity (or perhaps even your notoriety) will never be the same again!

Listing 2. 8K ROM.

```
  10 GOTO 100
  20 DIM A(150)
  30 INPUT A$
  40 FOR N=1 TO 150
  50 LET A(N)=CODE A$
  60 LET A$=A$(2 TO )
  70 NEXT N
 100 CLS
 110 PRINT "PRESS ENTER TO GENER
ATE PHRASE"
 120 INPUT A$
 130 PRINT
 140 PRINT
 170 FOR N=0 TO 2
 180 GOSUB 300
 190 PRINT " ";
 200 NEXT N
 210 PRINT
 260 PRINT TAB 8;"AGAIN? (Y/N)"
 270 INPUT A$
 280 IF NOT A$="N" THEN GOTO 100
 290 STOP
 300 LET I=INT (RND*4)+1
 310 FOR M=0 TO 9
 320 PRINT CHR$ (A((N*40+I*10)+M
-9));
 330 NEXT M
 340 RETURN
```

Listing 3. Lines for 8K ROM Continuous Running.

```
100 CLS
110 PRINT
170 FOR N=0 TO 2
180 GOSUB 300
190 PRINT " ";
200 NEXT N
210 PAUSE 120
290 GOTO 100
```

PRICES:
Baby BBU — 39.50
BBU-1 — 54.50
BBU-2 — 84.50

EVEN IF YOUR LIGHTS GO OUT YOUR COMPUTER WON'T

Introducing

NiCd Battery Back-Up Units from Syncware

- Make your ZX Portable BBU-2 runs over 2 hr. BBU-1 runs 1 hr. Baby BBU runs ½ hr.
- Make your ZX immune to line glitches!
- Protection against brown-outs, blown fuses, etc.

TIRED OF LINE GLITCHES GIVING YOUR COMPUTER AMNESIA?

Let Syncware take the annoyance out of computing. Baby BBU and BBU-1 use existing power supply; in case AC line goes dead or power supply gets knocked out of socket, battery takes over until power restored, preventing memory loss.

BBU-2 contains built-in heavy duty power supply, eliminating need for original supply. In addition, BBU-2's output is pre-regulated at 8 volts for additional glitch rejection, and also lets your ZX run considerably cooler. DON'T WAIT FOR A SUDDEN CRASH BEFORE YOU ORDER YOURS!

Prices are postpaid in continental U.S. Foreign orders — add $5.00. Payment must be in U.S. currency. Send check, money order or international M.O. only.

SYNCWARE CO.
4625 ELROVIA AVE.
EL MONTE, CA. 91732

Tactile Feedback Overlay

For: ZX 80/81, Timex 1000, or Microace
** TOUCH TYPING POSSIBLE
** STOP MISSED KEYS
** SPEED ENTERING PROGRAMS
With our easy to install keyboard overlay
$ 3.95

ZX 81 TIMEX Four Original 16k Programs

On a quality computer cassette

MATH TUTOR
Addition Subtraction Multiplication and Division. With five levels of achievement in each. From an introductory level to negative numbers and decimals.Menu driven.

TYPING SKILLS
A fun and competitive skill improver. You set the speed in words per minute then try to keep up with the computer. Great with our tactile feedback overlay!

BIRDS
Can you guide your missiles to intercept these horrible swooping creatures, while dodging what they drop? A ghastly end is in store if you are hit.

ASTRO SMASHER
Pilot your ship through the asteroid belt to find and destroy as many of the oppositions lurking ships as you can before your force shields give out. Careful though, if you hit the wrong part of their ship you blow up. Save the best score and try to better it next time.

$ 12.50 DUTY FREE From:

P. Hargrave, Site V, RR 4, Nanaimo, B.C. V9R5X9, Canada

ZX TELEPHONE BOOK
• Holds 720 names plus easy ADD/CHANGE/DELETE functions!
• Extensive "learner friendly" documentation even shows you how to add multi-access capabilities!
• Get this high performance 8K/16K listing at BIG SAVINGS:
• Only $4.95 from:
THOMAS B. WOODS
BOX 64
JEFFERSON, N.H. 03583

STAR VENTURE GAME:

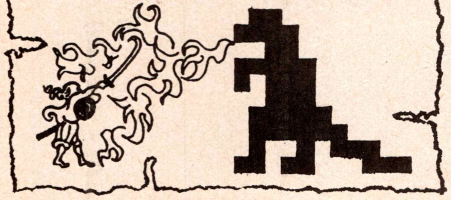
Seek out and destroy enemy vessels to move up in Star Fleet ranks.
Program listing $2.95
Cassette ..... $4.95 & $1.00 shipping

OTHER PROGRAMS AVAILABLE
Games, Accounting, and Microwave Cooking Chart for 8K/16K, ZX80/ZX81.

DSBC
P.O. BOX 1251
DOLAN SPRINGS, ARIZONA 86441

Medieval Fantasy

A graphically animated adventure game set in a small world. Fight monsters to gain power, wealth and magic items. ZX81/Timex-Sinclair 1000 with 16K or more of RAM. The price is $9.95 including shipping & handling. Daw Software, 78 Aberdeen Pl., Clayton, MO 63105



hardware tips

Some MicroAce Hardware Peculiarities

Irving Chaiet

Problem 1: Keyboard Entry

If your MicroAce will not accept keyboard entries or will accept some, but not all, the most likely hardware problem is a defective IC U11, a 74LS365.

The solution is to replace it. You *must know* that the replacement part (either a new 74LS365 original part or a substitute 74LS367) is a good working part, i.e., it has been tried in a working MicroAce and it works perfectly. I had ordered six 74LS365s from one source, and none worked properly. Even the replacements did not work. Then I ordered from Jameco three types (3-SN74365N, 3-74LS365, and 3-DM9085N which are equivalent made by National Semiconductor). All of these worked fine.

Sometimes IC19, a 74LS04, would not allow the computer to accept the shift key entries of + (-) > . Changing the IC19, the 74LS04, seemed to correct the problem.

Problem 2: Cursor Flicker

If your K cursor flickers or if the LS display flickers when the LET command is keyed in, the problem may be a defective IC U24, a 74LS74. The C12, a 47PF capacitor, could also be at fault. A good substitute for the latter is a 100PF capacitor.

Spare Chips

Since the LS series of chips used in the MicroAce is not expensive, I suggest having a spare set of known good chips on hand. Though you might never have to use them, the assurance of being able to plug in a known good chip balances off the possible frustration of time delay and expense in sending the instrument out for repair.

Here is a list of the chips to have on hand: 1-74LS00, 1-74LS04, 1-74LS05, 1-74LS10, 1-74LS32, 1-74LS74, 1-74LS86, 1-74LS93, 1-74LS157, 1-74LS165, 2-74LS365 or 74LS367 or plain 74365, 1-74LS373.

Note: be very careful to plug in the chips properly. Pin 1 of the chip must correspond to socket 1. Also be sure to prevent static discharges of your body to the computer.

Irving Chaiet, 25 Cherry Hill Rd., New Paltz, NY 12561.

References for Troubleshooting

The following articles on general hardware background and on hardware problems may be of further help.

SYNC

"Adding an LED Load Monitor to the ZX80 (MicroAce)," (1:1, p. 38).

"Four Tips for MicroAce Owners," (1:2, p. 5).

"Using the MicroAce with Sinclair Accessories," (1:2, p. 10).

"First Aid for Your Keyboard," (1:3, p. 3).

"Key Click Generator," (1:3, p. 40).

"The ZX80 Keyboard," (1:3, p. 42).

"A Parallel Interface for the ZX80/MicroAce Computer," (1:4, p. 38).

"Thick Black Bars," (1:6, p. 2).

"Cecil Bridges LED Load Monitor," (1:6, p. 2).

"Experiments in Memory and I/O Expansion," (1:6, p. 20).

"Hardware Helpers," (2:1, p. 28).

"4K/8K ROMs in One ZX80," (2:2, p. 40).

"Getting Loaded," (2:2, p. 41).

"Two-Switch Human Interface for the Communicative Impaired," (2:3, p. 23).

"Keyboard/System Conversion: The First 40/1 Keys," (2:3, p. 28).

Syntax

"8K ROM Modification," (2:4, p. 2).

"ZZZap! NS74LS365," (2:4, p. 6).

"Erratic Keyboard Entries," (2:4, p. 7).

"All Purpose Beeper," (2:6, p. 4).

"Pull-up Resistors—Keyboard," (2:8, p. 8).

"ZX80 Logic States of IC's," (2:9, p. 2).

"Video Sync Information and Tape Recording Loading Solutions," (2:9, p. 11).

"Trouble Shooting—The Effect of Removal of Each Chip from the Computer (incl. chart of equivalent ZX80/MicroAce IC numbers)," (2:10, p. 3).

"Power Plug Blinking Characters," (2:10, p. 9).

"SABRE Info on EPROM," (2:11, p. 1).

"Improve Video Driver," (2:12, p. 3).

Byte Magazine

"Memory Expansion for the ZX80," (Jan. 1982, p. 216).

"Add Full Size Keyboard," (Mar. 1982, p. 256).

"Adding a Reset Key," (Mar. 1982, p. 256).

LET YOUR ZX81-TIMEX 1000 WORK FOR YOU.

All programs:
On cassette and require 16K Ram.
Are menu driven and save on tape automatically.

SALES FILE:
Will hold up to 125 products with their wholesale and retail prices.
Separates and totals wholesale and retail prices and shows the amount of profit in up to 25 different accounts.
Records inventory automatically or may be changed manually. Keeps a running total of sales tax.
Has a cash register mode which will identify, total and add sales tax while it automatically does your bookkeeping.
A must for any small business. ----------$19.95

CHECKING:
Lists up to 30 deposits showing amount of deposit and date entered.
Lists up to 100 checks and displays check number, date and to whom check was written.
Lists by account the total of the checks written to any given account.
Keeps a running total of checks written and the balance left in your account.
Great for tax records. ----------$9.95

MAILING LIST:
Holds up to 100 names, addresses and telephone numbers.
Search by name, city, zip code, or phone number to find any address or phone number quickly.
Lists all names.
Changes or deletes.
Christmas cards are a snap with this program. ----------$9.95

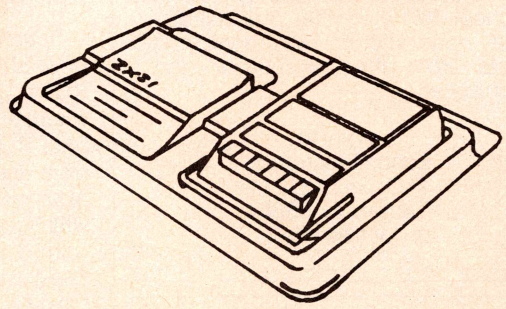
INVENTORY (1)
May be used for every thing from keeping an accurate inventory for your business, to your personal record collection.
Holds up to 150 items with comments for each.
Comments may be used for serial numbers, dates, prices or location.
List all items, search for a single item, change or delete any item.
----------$9.95

INVENTORY (2)
Same as above without comments.
Holds 300 Items. ----------$9.95

Three $9.95 programs for 24.95
Add $1.00 per tape shipping. IN Res. add 4% sales tax.
Send certified check or money order to:

HEATH COMPUTER SERVICES
950 East 52 South
GREENTOWN, IN 46936
317-628-3130

RUSKRAFT'S ZC ORGANIZER



MOLDED OF STURDY, BEIGE ABS, THE ZC ORGANIZER CONCEALS ALL THE ZX81 AND CASSETTE RECORDER CABLES, YET YOUR COMPUTER AND RECORDER ARE READY FOR INSTANT USE. SPACE IS ALSO PROVIDED FOR ADD ON MEMORIES SUCH AS THE 16K SINCLAIR, OR 64K MEMOTEK.

GIVE YOUR ZX81 IT'S OWN HOME -

JUST $14.95 + $2 SHIPPING/HANDLING

SEND CHECK OR MONEY ORDER TO:

RUSKRAFT ENGINEERING
P.O. BOX 306, DEPT. A
TINLEY PARK, IL.60477

PLEASE ALLOW 4 TO 6 WEEKS FOR DEL.

SOFTWARE BY C.E.D.CORPORATION

E-Z BOOKKEEPING FOR SMALL BUSINESS (TAKES LESS THAN ½ HOUR PER MONTH). ALSO GOOD FOR HOUSEHOLD BUDGETING.

CHECKING ACCOUNT (MAKES CHILDS PLAY OF THIS JOB)

BY-IT-SELF ITS GREAT BUT IT WAS DESIGNED TO WORK WITH E-Z BOOKKEEPING

MACHINE LANGUAGE NIT-PICK (GREAT FOR LEARNING ASSEMBLY LANGUAGE PROGRAMING)

WORD PROCESSOR (IT WAS USED TO WRITE THIS AD)

ORDER FROM C.E.D. CORPORATION
P.O. BOX 222, SALEM, WISCONSIN 53168

PRICE LIST

	TAPE	LIST	BOTH
E-Z BOOKKEEPING	$19.95	$ 8.95	$27.95
CHECKING ACCOUNT	$ 9.95	$ 5.95	$14.95
ABOVE TWO AS A PACKAGE			$41.95
M.L. NIT-PICK	$18.95	$ 7.95	$25.95
WORD PROCESSOR	$18.95	$ 7.95	$25.95

SPECIFY ZX80-1 OR TRS 80 COLOR COMPUTER
ZX80-1'S NEED 16K RAM
TRS 80 NEEDS 16K RAM

ALL OF OUR PROGRAMS ARE MENU DRIVEN AND ALL DATA CAN BE STORED ON TAPE AND OR SENT TO A LINE PRINTER

WE HAVE TELEPHONE SUPPORT FOR PROBLEMS OR QUESTIONS
CALL (414) 276-8787

IT'S HERE!!!

THE NEW KEYBOARD YOU'VE BEEN WAITING FOR!

A 60 KEY TACTILE FEEL KEYBOARD THAT PLUGS INTO ZX-81 OR TIMEX SINCLAIR 1000. INCLUDES ALL SILKSCREEN LEGENDS IN 3 COLORS. GRAPHICS AND LEGENDS MOULDED IN KEYTOPS. 8 ADDITIONAL KEYS FOR EDIT, DELETE, QUOTE, FUNCTION, "":; STOP. (NO SHIFTING REQUIRED). MEASURES 10"X4". HAS 5" SPACE BAR, TWO SHIFT KEYS AND A NUMERIC KEY PAD.

$70.00 MASS RESIDENTS ADD 5% SALES TAX
SHIPPING & HANDLING $4.00 PER UNIT

DELIVERY 3-6 WEEKS.
QUANTITY DISCOUNTS FOR USER GROUPS.
ACCEPT M/C, VISA #s. INCLUDE EXP. DATE & SIGNATURE. FOR MORE INFORMATON SEND SASE OR TO ORDER SEND CHECK OR MONEY ORDER TO:

E-Z KEY
SUITE 75
711 SOUTHERN ARTERY
QUINCY, MASS 02169

EDSON ELECTRONICS OFFERS

Educational programs for grades 1-4 that reinforce what they learn in school. We also offer a digital display load monitor for monitoring data from the cassette to the computer.

Write to
Edson Electronics
P.O. Box 151211
Tampa, Fl. 33684
for free info.

ZX81 Software: Plotter 1 — A sophisticated routine that plots and graphs any function. (16K) $9.99 (U.S.)

Two Handed Euchre—Challenge the computer in this entertaining and skillful game. (64K) $14.99 (U.S.)

J.C. Software
28 Shipley Rd.
Weston, Ontario, Canada.
M9R-3H8

ZX-80 8K ROM USERS

Completely expand your ZX-80 with 8K Rom to a ZX-81 with full use of *Fast* and *Slow*. Smooth flicker free performance!

Complete Kit: $32.50 & $2.50 postage & handling; PCB only $19.95 & $1.25 p&h; Parts Kit Only $12.55 & $1.25 p&h.

The Expandable ZX-80 and ZX-81
A book of hardware projects that you can build yourself, from memory expansion to speech synthesis. Only $9.95 & $1.25 p&h.

Program writers: We publish software and complete books. Write for details.

COMPUTER ENGINEERING SERVICES
The Jarrett Company
P.O. BOX 1222
SHOW LOW, ARIZONA 85901

(Dealers Inquiries Invited)

CUSTOM ATTACHE CASE
FORM FIT FOR ZX80/81,
TIMEX SINCLAIR 1000 AND
HARDWARE. FOR INFORMATION
SEND SASE. TO:
COMPUTA-DEK
6009 KENWOOD DRIVE
NASHVILLE, TENNESSEE 37215

ZX81/16K
ADVENTURE GAME — $9.00
With cassette and manual
ADVENTURE GAMES
10-35 St.
Des. Moines, Ia 50312

Keyboard Bleeper — no soldering required. $19.00 total.
Loading Aid — ZX80/ZX81/timex 1000 $21.00 total.
T-Shirts — red "Sinclair ZX81" on black. State size. $7.00 total.

Fulcrum Products, Dept. U
Hillside Steep Lane
Findon, W. Sussex, England
BN 14 ONF

8K ROM Updates

In the first issues of *SYNC* the programs were all for the 4K ROM. When the 8K ROM became available, we tried wherever possible to provide listings for both ROMs. Since we have had requests from readers for updated versions of some of the programs we published earlier, we will include these from time to time.

Translated to 8K ROM by James Grosjean, 50 Kings Rd., Chatham, NJ 07928.

Hurkle

Laura McLauglin

The Hurkle is hiding deep in the forest and you must find it by logical deduction. Type in the program, hit RUN and ENTER. The prompts will call for the input of two coordinates (X,Y) corresponding to a point on a 10x10 grid. The computer will then tell you in which direction the Hurkle is hiding. Again you enter a new set of coordinates and continue until you have found the Hurkle or used up your five guesses. The program fits in 1K RAM. With sufficient RAM, Hurkle could be expanded to show the grid on the screen and record your entries.

```
  1 CLS
  2 LET A=INT (RND*10)+1
  4 LET B=INT (RND*10)+1
  6 FOR K=1 TO 5
  8 PRINT "GUESS NUMBER ";K
 10 PRINT "X COORD?"
 12 INPUT X
 14 PRINT "Y COORD?"
 16 INPUT Y
 18 IF ABS (X-A)+ABS (Y-B)=0 TH
EN GOTO 40
 20 CLS
 22 PRINT "X=";X;" Y=";Y;" ";
 24 GOSUB 50
 26 NEXT K
 30 PRINT "SORRY, THAT IS 5 GUE
SSES."
 32 PRINT "PLAY AGAIN?"
 34 INPUT A$
 36 IF NOT CODE A$=62 THEN STOP

 38 RUN
 40 PRINT "YOU FOUND HIM IN ";K
" GUESSES."
 42 GOTO 32
 50 PRINT "GO ";
 52 IF Y<B THEN GOTO 62
 54 IF Y>B THEN GOTO 60
 56 PRINT "SOUTH";
 58 GOTO 62
 60 PRINT "NORTH";
 62 IF X=A THEN GOTO 72
 64 IF X<A THEN GOTO 70
 66 PRINT "WEST"
 68 GOTO 72
 70 PRINT "EAST"
 72 PRINT
 74 RETURN
```

Castle Doors

Weldon J. Horton, Ph.D.

Castle Doors is an adventure game that presents a new challenge with each playing and easy adjustment of the difficulty level. The object is to defeat the wizard.

Type in the program, hit RUN, and ENTER. The display will show your strength and ask whether you want to open a door or fight the wizard. The display will continue to confront you with options which will either use up your strength or add to your strength. When you feel your strength is sufficient, you may take on the wizard.

The variables in lines 26-34 may be changed to provide different challenge levels.

```
  2 PRINT
  4 PRINT "WELCOME TO CASTLE DO
ORS"
  8 LET B=RND*300
 10 LET C=INT (RND*50)+1
 12 GOSUB 200
 22 PRINT "4: OPEN A DOOR  5: F
IGHT WIZARD"
 26 LET D=INT (RND*8)+1
 28 LET A=0
 30 LET E=RND*50+1
 32 LET F=INT (RND*100)
 34 LET G=INT (RND*25)+1
 38 INPUT O
 40 CLS
 41 IF O=5 THEN GOTO 176
 42 LET A=INT (RND*(D*10+10))+1
 43 GOTO (D+21)*2
 44 LET A$="CYCLOPS"
 45 GOTO 60
 46 LET A$="WITCH"
 47 GOTO 60
 48 LET A$="DRAGON"
 49 GOTO 60
 50 LET A$="GARGOYLE"
 51 GOTO 60
 52 LET A$="ZOMBIE"
 53 GOTO 60
 58 GOTO 160
 60 PRINT
 62 PRINT
 70 PRINT "YOUR OPPONENT IS A "
;A$
 72 GOSUB 200
 80 PRINT "ENTER   1: FIGHT 2:
BRIBE 3: RUN"
 84 INPUT N
 86 CLS
 88 IF N=2 THEN GOTO 124
 90 IF N=3 THEN GOTO 148
 92 IF C<A THEN GOTO 176
 94 GOSUB 200
104 PRINT "HOW MUCH STRENGTH WI
LL YOU USE?"
106 INPUT Q
108 CLS
109 PRINT
110 PRINT
112 IF Q>C THEN GOTO 94
114 IF Q>=A THEN LET C=C+G
116 IF Q>=A THEN PRINT "YOU WIN
 BRAVE ADVENTURER"
118 IF Q<A THEN LET C=C-Q
120 IF Q<A THEN PRINT "YOU LOSE
TO THE ";A$
122 GOTO 12
124 GOSUB 200
132 PRINT "SIZE OF BRIBE?"
134 INPUT P
136 CLS
138 IF P>=E THEN LET C=C-P+G
140 IF P>=E THEN PRINT "ACCEPTE
D"
142 IF P<E THEN PRINT "REFUSED"
144 IF P<E THEN GOTO 60
146 GOTO 12
148 PRINT
150 PRINT
152 IF F=7 THEN GOTO 176
154 PRINT "YOU GOT AWAY"
156 LET C=C-INT (RND*15)+1
158 GOTO 12
160 PRINT
162 PRINT
164 IF D=6 THEN PRINT "SAVE PRI
NCESS AND GAIN 50 POINTS"
166 IF D=6 THEN LET C=C+50
168 IF D=7 THEN PRINT "A FAIRY
GIVES YOU A POTION WHICHDOUBLES
YOUR STRENGTH"
170 IF D=7 THEN LET C=C*2
172 IF D=8 THEN PRINT "A GIANT
BAT TAKES YOU TO ANOTHERDOOR"
174 GOTO 12
176 PRINT
178 PRINT
180 IF C>=B THEN PRINT "YOU KIL
LED THE WIZARD-YOU WIN"
182 IF C<B OR C<A OR C<1 OR F=7
THEN PRINT "YOU FOUGHT WELL BUT
 LOST-GAME   OVER"
184 STOP
200 PRINT
201 PRINT
202 PRINT "YOUR STRENGTH IS ";C
203 PRINT
204 PRINT
205 IF C<1 THEN GOTO 182
206 RETURN
```

ZX81 2K UPGRADE KIT $15

DOUBLE YOUR 2X MEMORY TO 2K ON-BOARD. KIT INCLUDES ALL REQUIRED COMPONENTS AND DETAILED ILLUSTRATED MANUAL. COMPATIBLE WITH 1 OR 2 CHIPBOARDS. $2 REBATE FOR YOUR OLD CHIPS.
J. BALOGH, P.O. BOX 1319
STATE COLLEGE, PA.
16801

SINCLAIR ZX81 & TS1000 SOFTWARE
Fifty games for less than $2 ea.
Send SASE for FREE catalog to:
BIOCAL SOFTWARE
340 Cypress Dr.
Fairfax, Calif. 94930

16K ZX-81 SOFTWARE

FOR THE HOME:
CHECKBOOK BALANCE
ENERGY ANALYSIS
VIDEO CALC
EDUCATIONAL:
ARITHMETIC TUTOR
ALGEBRA TUTOR
SPANISH TRANSLATOR
ENTERTAINMENT:
ANIMAL QUIZ
PLAY THE MARKET
ENCRYPTOR

EACH ON A HIGH QUALITY C-10 CASSETTE @$9.95 EACH.
SEND SASE FOR PROGRAM DESCRIPTIONS

P & B SOFTWARE
1155 E. MALIBU DRIVE
TEMPE AZ 85282

OTHELLO FOR 1K
GRAPHICS, HIGH-SKILL PLAYING ALGORITHM
PROGRAM LISTING — $2.00
INTELLECTUAL GAMES
193 PEACEABLE ST.
RIDGEFIELD, CT 06877

IMPORTED GAME CASSETTES
ZX81 16K $14.95 EACH
"TRADER JACK" FANTASTIC FUN GAME.
BUSINESS LOGIC — SOUTH PACIFIC LOCAL.
"ZX81 MONOPOLY" UP TO 6 PLAYERS.
SPECIFY EITHER SPANISH, BRITISH OR AMERICAN LANGUAGE VERSION.
SAVAGE SOFTWARE, PO BOX 441
TITUSVILLE, FL. 32780

Nicomachus

David Ahl

Type in the program, press RUN, and ENTER. The prompts on the screen will tell you what to do. Type in your entry followed by ENTER. The computer will then figure out your number by logical deduction. The program fits in 1K RAM, and runs better in SLOW mode.

```
  10 LET A$="WHEN DIVIDED BY "
  20 LET B$=" ITS REMAINDER IS?
"
  30 PRINT "THINK OF A NUMBER FR
OM 1 TO 100."
  40 PRINT A$;3;B$;
  50 INPUT A
  60 PRINT A
  70 PRINT A$;5;B$;
  80 INPUT B
  90 PRINT B
 100 PRINT A$;7;B$;
 110 INPUT C
 120 PRINT C
 130 PRINT "LET ME THINK A MOMEN
T..."
 140 LET Y=70*A+21*B+15*C
 150 IF Y<106 THEN GOTO 180
 160 LET Y=Y-105
 170 GOTO 150
 180 PRINT "YOUR NUMBER WAS ";Y;
", RIGHT?"
 190 INPUT A$
 210 IF CODE A$=62 THEN PRINT "H
OW ABOUT THAT."
 220 IF CODE A$=51 THEN PRINT "I
THINK YOU MISCALCULATED."
 230 PRINT "WANT TO TRY ANOTHER?
 (Y/N)"
 240 INPUT D
 250 CLS
 260 RUN
```

Widget

Gary McGath

To play Widget type in the program, press RUN and ENTER. The screen prompts call for you to make executive decisions. Type in your decision and hit ENTER. After computing your decision, your ZX81 will post your new financial position and the number of many months you have been in business. The object of Widget is to avoid bankruptcy. The program requires a 2K machine.

```
   5 RAND
   6 LET Z=1
  10 LET P=1
  20 LET M=900
  30 LET I=0
  40 LET S=10
 100 CLS
 110 PRINT "MONTH  ";Z
 120 LET Z=Z+1
 300 PRINT "YOU HAVE";TAB 16;"$"
;M;"00"
 310 PRINT TAB 8;P;" PLANTS"
 320 PRINT TAB 8;I;"00 WIDGETS"
 330 PRINT "LAST MONTH YOU SOLD
";S;"00"
 350 IF M<1000 THEN GOTO 410
 360 PRINT "BUY A PLANT?"
 370 INPUT Y$
 380 IF Y$<>"Y" THEN GOTO 410
 390 LET P=P+1
 400 LET M=M-1000
 410 PRINT "AD BUDGET IN 100$ ?
"
 420 INPUT B
 430 IF B*10>M THEN GOTO 420
 440 LET M=M-B*10
 450 PRINT "PRODUCTION IN 100S ?
"
 470 INPUT W
 480 IF W>10*P THEN GOTO 470
 490 LET I=I+W
 500 LET S=INT (S/INT (RND*3+3))
 510 IF B<6 THEN GOTO 550
 520 LET S=S+(B-6)*5
 530 LET B=6
 550 IF B<2 THEN GOTO 600
 560 LET S=S+(B-2)*7
 570 LET B=2
 600 LET S=S+B*8
 610 IF S>I THEN LET S=I
 620 LET M=M+S*10
 630 LET I=I-S
 640 LET M=M-20*P-20
 650 LET M=M-(W-1)*5
 660 IF M>=0 THEN GOTO 100
 800 PRINT "YOU ARE BANKRUPT."
```

SYNC-hronizing Education and Games

A newsletter filled with games and ideas for the Sinclair.
A Quarterly publication that is a must for all Sinclair owners.
Send $7.00 U.S. $8.00 Canadian to:

SYNC-hronizing Education and Games
c/o Henry Svec
668 Sherene Terrace
London Ontario
Canada N6H 3K1

(Cheques payable to Henry Svec)

IS YOUR FAMILY TIRED OF PLAYING GAMES ON YOUR MICRO?
ARE YOU LOOKING FOR WAYS OF CHALLENGING YOUR INTELLECT?
QUIZ WIZ IS THE SOLUTION!
Through QUIZ WIZ you can test your family's general knowledge on your 16K ZX81.
INTRODUCTORY OFFER! FIRST ISSUE
Two Quizzes Per Cassette $4.37.
OR BETTER YET! Full Year Subscription
Six Issues-Six Cassettes $22.47.
Send check or money order to:
S.C.I.
Box 553
Mechanicsville, Virginia 23111
Virginia Residents add 4% sales tax.
Overseas orders add $1.00.

ADD ON MEMORY FOR ZX

16K memory assembled and tested. No extra power supply needed. 90 day warranty on parts and labor.

$45.95 POSTPAID

Check or money order only.
California residents add 6%.

KB ENTERPRISES
8211 VALDOSTA AVE.
SAN DIEGO, CALIFORNIA
92126

resources

The "Resources" column lists new products for Sinclair users. Suppliers and users are invited to send brief product descriptions and details for ordering to: Resources, SYNC, 39 E. Hanover Ave., Morris Plains, NJ 07950.

User Groups

- Kaiserslautern, Germany ZX81 Users Group. Just being started. Contact:
  Tom White
  HG 21st SUPCOM
  ACSRM - IRD
  APO NY 09325
  Phone: 2221-7432

- The Sinclair Users Group of San Diego. For information contact:
  Robert Jorgenson
  3814 Coleman Ave.
  San Diego, CA 92154

User Groups Forming

- Any Portland, Oregon, area users interested in forming a group? Contact:
  J. E. De Groot
  2146 N.W. Johnson St., 108
  Portland, OR 97210

Business/ Household Programs

- *ZX Phone Book.* Holds 720 names with edit functions of ADD, CHANGE, DELETE, and SAVE; search by name or category; can be used for other information. 16K RAM. Hard copy listing with thorough documentation: $4.95
- *Sort-a ZX81.* Collating tool; counts and files thousands of items in up to 29 categories on just 1K RAM; listing and notes show how to use your ZX81 as a home and office tool. Hard copy listing with thorough documentation: $4.95.
  Thomas B. Woods
  PO Box 64
  Jefferson, NH 03583

- *Data Storage and Display System.* Stores up to 60 data points in a file, e.g., stock prices, profit-loss data, experimental data; allows file crunching for plotting; up to 25 files can be saved under user-defined titles; recalled in tabular or graph form; menu lists 9 jobs; expandable with additional cassettes. 8K ROM; 16K RAM. $14.75 plus $1.25 s&h.
  ZX-Panding, Ltd.
  PO Box 25
  Newton, NC 28658

Educational Programs

- *Vocab Builder for the ZX81.* 60 words per cassette; 2 modes; definitions and quiz; for teens and adults. 16K RAM. $9.50.
  Charles Bucher
  132 E. Pasco Lane
  Cocoa Beach, FL 32931

Games

- *ZX81 Bomber.* Drop bombs and two types of missiles on the enemy; graphics; points and percentage; full documentation and instructions. 8K ROM; 1K RAM. Program: $1.00 plus SASE. Cassette: $3 plus $1 s&h.
  Rimas Buntinas
  7440 N. Rockwell
  Chicago, IL 60645

- *Trader Jack.* You are captain of your own trading vessel sailing the South Pacific; buy supplies; fight storms and volcanos; trade your cargo, hopefully for a profit. 8K ROM; 16K RAM. Also ZX81 Monopoly in Spanish, American, or British versions. Each game on cassette: $14.95.
  Savage Software
  PO Box 892
  New Smyrna Beach, FL 32069

- *Pick'em.* Program to attempt to predict outcome of national football league games and even the point spread; accepts information available from most daily newspapers. 8K ROM; 16K RAM. Cassette: $9.95 plus $1.50 s&h.
  Stuart Software
  25381-G Alicia Pkwy., Suite 316
  Laguna Hills, CA 92653

- *Mad Dog Tank Blaster.* Mammoth program with routines useful in your own programming. Wild tank moves through grid-like maze blasting all the way; your man must put a mine in its path without getting shot, run over, or blown up by the mine. Hard copy listings with thorough documentation to teach programming. 16K RAM. $6.95.
  Thomas B. Woods
  Box 64
  Jefferson, NH 03583

- Arcade excitement on your 1K or 2K ZX81. All programs have moving graphics; sold as listings. Pickle Man: $2; Tempestuous Battle: $2; ICBM Barrage: $2; Monkey Barrels: $2; Defense Wave: $1.50; Evade: $1; Lander-X: $1.50. Add $0.30 s&h.
  Panero Software
  3309 Lewis Ave.
  Long Beach, CA 90807

- *Game Pack for the ZX81.* Bomber (move the bomb sight over the target, very fast); Missile (destroy the missiles before they hit your spaceship); Auto 3-D (enter 4 numbers; ZX81 will draw tunnels and spirals and much more depending on numbers); Speed Draw (the ZX81 starts a line; control it by the right keys to produce all sorts of pictures). 8K ROM; 1K RAM. All four on one cassette: $5 plus $3 s&h.
  Mark E. Rogers
  553 Melrose Dr.
  LaPlace, LA 70068

- *18 Hole Golf.* Graphics display of each hole, moving ball, 3 types of hazards; 4 player capability; final score card display; 3 different courses. 8K ROM; 16K RAM. Cassette: $10.
  R. Midura
  19 Merrifield St.
  Worcester, MA 01605

Graphics Programs

- Memopak High Resolution Graphics. Contains 2K EPROM monitor, holding full range of graphics subroutines called up by USR or machine code; gives 192 x 248 pixels. Video pages: each requires about 6.5K RAM; memory and bit mapped; can be located anywhere in available RAM. $149.95.
  Memotech
  7550 West Yale Ave., Suite 200
  Denver, CO 80227

KEMPSTON MICRO ELECTRONICS

PRESENTING THE NEW . . .

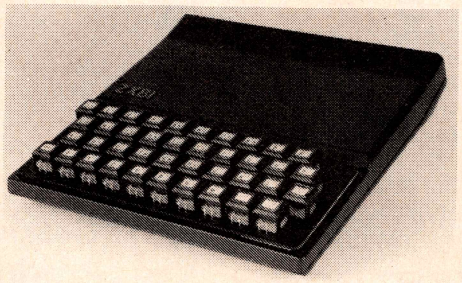
ZX KLIK - KEYBOARD

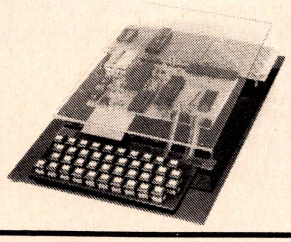
IF YOU ARE like many ZX81 users and are fed up with the dead 'touch sensitive' key pad then consider the advantages of the new KEMPSTON KLIK-KEYBOARD. This is a genuine push button keyboard which has been designed as an exact replacement, being no larger than the existing key pad, but offering all the advantages of a full size keyboard. Consider these facts:

- Fits on to the ZX81.
- No soldering needed on the assembled version (just plug in)
- No trailing wires.
- No special case required.
- Positive feedback from keys.
- Full two colour legends supplied.
- Full back-up service offered, including fitting.

This is a genuine 40-key, push button keyboard which fits into the recess formed after peeling off the existing touch sensitive keypad.

The kit comes with a precision drilled P.C.B. finished in matt black, 40 keys, 2 colour legends, connecting tails, adhesive pads and a full set of instructions.





Also available from our range of products is a Parallel User I/O post £16.50 built & tested. Gives 16 I/O lines to drive light relays, motors etc. Many already sold to education. Keyboard bleeper £8.95 built.

Your Name and Address _____

Date

Quantity	Description	Unit price	Amount
	ZX81 Keyboard Kit	$45.00	
	ZX81 Keyboard Assembled	$52.00	
		Sub total	
		Postage	$4
		Total due	

Please allow 14 days for delivery.

Kempston Micro Electronics

60 Adamson Court, Hillgrounds Road, Kempston, Beds. MK42 8QZ

Proprietor A. Pandaal, B.Sc., P.G. Cert. Ed.

Peak

Cassette Software for the 8K ROM, 16K RAM Sinclair

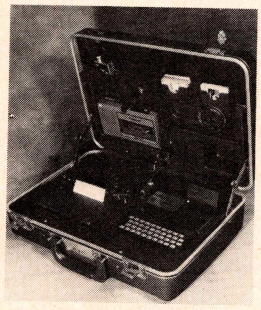
BLACKJACK - Practice your strategy. Hit, stand, double down, split and take insurance with this Nevada casino game. Plays out a complete deck. $10

TEXT - A program for easy text editing, storage and display. Recall pages of text without splitting words at the end of a line.

PRODIR - A programmed directory to organize programs and ease loading. Both TEXT and PRODIR for $10

Prices include shipping.
Send check to:

Peak, P.O. Box 383,
San Carlos, CA 94070



MAKE YOUR SINCLAIR A PORTABLE COMPUTER SYSTEM

MAC (MOHR & Associates Corporation) Now Offers You A Durable, High Impact ABS Plastic Briefcase That Measures 17½" X 12¼" X 4½". Wired For 110-60HZ And Ready To Be Used!
You Merely Insert Your Sinclair Components (Including Printer) In the Preformed Cavities And BINGO You Have A Portable Computer System. The Briefcase Has Slots For Tapes, Coax Cable And The TV Adapter.

$149.95 Includes Shipping & Handling.
Kansas Residents add 3% Sales Tax.

TO ORDER
SEND CHECK OR MONEY ORDER
MOHR & ASSOCIATES CORP.
645 N. Baltimore
Derby, KS 67037
(316) 788-1526/788-3165
MC/VISA ACCEPTED

SALE -ZX81 EDGE CONNECTOR $4.95
5/$23-ADD 50¢EA.
INTRODUCING:
PTX-I/O: Ø TO 16 PORT EXPANDABLE INPUT-OUTPUT PORT SYSTEM. COMMANDS IN BASIC. KEYBOARD PORT, D/A, A/D, FREQUENCY GENERATOR... USE YOUR COMPUTER TO IT'S MAXIMUM !!!
SASE GETS DETAILS
POWERTRONIX
25 E 23 ST. BAYONNE
N.J. 07002 USA

ZX TYPING TUTOR
- LEARN ALPHA NUMERIC KEYBOARD
- THREE SKILL LEVELS
- INSTANT FEEDBACK AND FINAL SCORE
- GET THIS HIGH PERFORMANCE 8K/16K LISTING AT BIG SAVINGS.
- ONLY $4.95 FROM:
MICRO-TECH
1019 BRANDON LAKES AVE.
VALRICO, FLORIDA 33594

MARKETING SERVICES
For those unfamiliar with techniques in marketing methodology.
Send us your original programs for review.
Send S.A.S.E. for full details, now.
Timex Software Company
Box 48595
Chicago, Illinois 60648-0595

The Troiano Software Company is now offering for the ZX81 a graphics, games, accounting, math and utility package with 12 programs in all! Only $4.00.
Troiano Software Company
PO Box 40
Nesconset, New York 11767

ZX81 Assembler
2 Pass Standard Mnemonics, Symbolic expressions, Decimal / Hexadecimal, 12K Basic and machine code.

ZX81 Disassembler
Standard Mnemonics, Decimal / HEX
$18.00 for both programs postpaid

Bob Berch
19 Jaques St.
Rochester, N.Y. 14620

Catalogs/Directories/ Product Lists

- Programs for the ZX81. Games, business, household, statistics, cards, aids, horse racing, and other general items. Free catalog.
  UAS
  PO Box 612
  Haddonfield, NJ 08033

- Game, utility, household programs. 16K RAM/1K RAM. For details send SASE (postage $.40).
  Gampper
  Zollamtstrasse 52
  675 Kaiserslautern
  West Germany

- *The Sinclair Computer Family Sourcebook.* Lists over 500 programs, books, accessories from over 80 manufacturers. $4.95 plus $1.25 s&h (add 4% tax in Virginia).
  Atlantic Computer Products
  PO Box 936
  Norfolk, VA 23501

- Howard Hein is compiling a directory of services and supplies for the Timex/ Sinclair 1000. He invites readers to supply information on: hardware and software suppliers; hardware and software projects (including listings); user groups; newsletters; reviews in magazines and books; suppliers of training; shows and festivals. Submissions and comments to:
  Howard Hein
  33 Oak Lane
  Mt. Lakes, NJ 07046

RAM Expansion

- Memopak 16K RAM. Accepts further memory units plugged in "piggy-back" fashion (Memopak 16K, Memopak 32K, or Sinclair 16K) and other add-on peripherals. $59.95.
- Memopak 32K RAM. Full 32K RAM directly addressable. Accepts Memopak 16K RAM as plug-in. $99.95.
  Memotech
  7550 West Yale Ave., Suite 200
  Denver, CO 80227

Printers

- MW 100 Printer. Available now. Prints on plain paper roll, 1 3/4 inches wide; standard tape and ribbon obtainable at office equipment and electronics stores. For details:
  Mindware, Inc.
  70 Boston Post Rd.
  Wayland, MA 01778
  (617) 358-7175

Interfaces

- Memopak Centronics Parallel Printer Interface. Enables ZX81 to be used with a wide range of dot matrix and daisy-wheel printers. Resident software gives ASCII character set. $94.95.
  Memotech
  7550 West Yale Ave., Suite 200
  Denver, CO 80227

- ZX99 Automatic Tape Control. Full software control of up to four tape decks (two for loading; two for saving) to mix and modify files; uses tape for data storage; automatic tape copy; diagnostic information for best recording; RS-232-C interface to connect to any such serial printer using standard ASCII; 2K ROM extends the ZX81 8K ROM and accessed by USR. $150.
  Data-assette
  H.S.W. & S., Inc.
  52 South 3rd St.
  Oxford, PA 19363
  (215) 932-3626

Keyboards

- ZX80/1 Keyboard. Keytops finger shape molded; characters for the ZX keyboard printed in two colors on keytops as per your ZX80/1; repeat key; black plastic molded case available (can be purchased separately); 12-inch ribbon cable attached by 15 solder connections; full instructions. $75.
  Data-assette
  H.S.W. & S., Inc.
  52 South 3rd St.
  Oxford, PA 19363
  (215) 932-3626

- 44 key tactile keyboard; plugs into ZX81 or Timex/Sinclair 1000; all graphics included; EDIT, DELETE, ", and FUNCTION do not require shift. $70 plus $4 s&h (add 4% tax for Massachusetts
  E Z Key
  Suite 75, 711 Southern Artery
  Quincy, MA 02169

- Keyboard overlay. Gives tactile help in making keystroke entry; stops missed keys; speeds program entry; simple to install. $3.95.
  P. Hargrave
  Site V, R.R. 4
  Nanaimo, B.C.
  Canada V9R 5X9

- E-Z Key 44. Hear a click and feel a snap for every key pressed; 4 special keys have electronic control to eliminate need to use shift key (DELETE, EDIT, ", FUNCTION); accesses all graphics and functions; no wiring required; just plug it in; adaptable to ZX80 or Micro-Ace; schematic and instructions. $70 plus $4 s&h (add 4% tax for Massachusetts.
  E-Z Key
  Suite 75
  711 Southern Artery
  Quincy, MA 02169

Hardware Improvements

- ZX81 Improved Heatsink. Prevent system crashes caused by overheating of voltage regulator; no modification of appearance or function of the ZX81 needed; installed in minutes. $10.
  B. Sanzone
  289 Baxter Lane
  Milford, CT 06460

- End edge connector tarnish problems. Electro-plate the fingers with 24 karat gold. $15 plus $3.75 s&h for first item; $10 plus $2.75 for any additional item with the same order. *Do not send* the product you want plated now. Instead send SASE for full details first.
  Matthew Zenkar
  142 Holcroft Rd.
  Rochester, NY 14612

System Expansion

- System expansion kit. Install permanent system utilities such as machine language or service routines in up to 8K memory that is not lost when you reset or turn off your ZX81; compatible with 16K RAM packs. Full details and all components including one 2K HM6116P-3 CMOS RAM: $29.95 plus $1.95 s&h. PC board alone, masked and silkscreened: $15 postpaid. Additional 2K HM6116P-3 (150 ns): $9 each.
  Hunter
  1630 Forest Hills Dr.
  Okemos, MI 48864

Tape Accessories

- Winky Board Cassette Loader/Duplicator Interface. Makes loading easy; includes LED level monitor, earphone eavesdropper and interference filter, circuits for direct copying of any cassette. Kit: $12; assembled and tested unit: $18. U.S. postpaid; overseas: add $2. Free information.
  G. Russell
  RD 1, Box 539
  Centre Hall, PA 16828

- ZX Loading Aid. Circuit detects and shows signal level on two LEDs to enable you to distinguish program, introductory buzz, silence, voice overs; in small black metal box 90x35x30mm with two 3.5mm sockets and two 3.5mm jacks; connects between tape player and computer. 1%9.95 (incl. s&h and VAT); $21. Specify which computer you will use it on.
  Fulcrum Products
  "Hillside" Steep Lane, Findon
  Worthing, West Sussex BN14 0UF
  United Kingdom

- Chirper module. Gives acoustic feedback on keystrokes as a variable chirp that remains on until the ZX81 is ready for another entry; produces sound while program runs; sounds can be programmed either in Basic or machine code; fits inside ZX81; solder 3 wires. $9.95.
  Audiograph Co.
  3584 Leroy
  Ann Arbor, MI 48103

T-Shirts

- T-Shirts and Sweatshirts. SoftWEAR for the ZX81 owner. T-shirts with round neck and short sleeves; sweatshirts with long sleeves and heavy weight fleecy lining. Red lettering "Sinclair ZX81" on black or white shirts. Adults: 34", small; 36", medium; 38-40", large; 42-44", extra large. Children: 24", 26", 28", 30", 32". T-shirts: £3.25 or $7; sweatshirts: £6.99 or $16.
  Fulcrum Products
  Hillside, Steep Lane
  Findon, Worthing
  West Sussex BN14 0UF
  United Kingdom

Video Upgrade

- Video Upgrade Kit. For ZX80 8K ROM; smooth flicker free video; performance is exactly that of the ZX81; easy assembly and installation inside the ZX80. $32.50 plus $2.50 s&h.
  Computer Engineering Services
  PO Box 1222
  Show Low, AR 85901
  (602) 537-7522

8K ROM; 16K, 1K. Games, Utilities, Tech prog., Household prog. & more. For details send SASE to:
NGM INC.
P.O. BOX 18702
OKLA CITY, OK
73154

COLOURSCREEN
FOR TIRED EYES

Fit one of our colourscreens to your T.V. and cure those programmers eyes. Available in 3 sizes and 5 colours.
Blue, Green, Red, Yellow and Orange.
Small (9" x 12") $1.75
Medium (12" x 15") $2.95
Large (18" x 24") $4.50

Plus $2.00 airmail postage
Order now direct from the U.K.

Ellanbee (Graphics)
11 Lichfield Close,
Great Lumley,
Chester-Le-Street,
Co. Durham
DH3 4QH U.K.

ZX-81/1K
Listing of 5 games $2.00
Solo/2 Player Games
2 Graphic Displays,
Stock Market, Random Race,
Treasure Hunt.
Z-Games
P.O. Box 367
Ringles, N.J. 08551

CAR LOG
A new USEFUL suite of professional programs for the ZX81(16K).
1.) Very simple to use with full instructions.
2.) Complete cassette record of mileage and itemised expenses.
3.) All conceivable ratios, totals and projections computed.
CAR LOG is suitable for your car, your dad's car or your whole fleet of trucks.
Only $14.95
NIMROD SORTWARE
4 Stanley Rd.,
London, SW14 7DZ U.K.

NEW for your ZX 81
Microtronics-LR, inc.
is introducing a new
peripheral for the
Sinclair ZX 81 soon!
Watch for our ad.

VOYAGER ADVENTURE
Your space craft has landed on a barbaric planet, attempt to save your own planet. Here you will meet up with more than 20 different encounters. You'll have your choice of one of over 34 billion characters available. This adventure is huge (two sides-16K each) and is saveable once in progress. Send $9.95 or for more, send to Chris White, 789 S. Greenbay Rd., Lake Forest, IL. 60045.

Ephemeris V

PLANET FINDER FOR THE 16K TS-1000/ZX-81

MERCURY, VENUS, MARS, JUPITER and SATURN are all visible to the naked eye. The ancients recognized that their special quality is that they move against the background of "fixed" stars. Predicting their movements has been the preoccupation of geniuses for thousands of years. Now these movements are well understood, buy only by a few dedicated observers. Ephemeris V is designed for these people and others (ages 12 and up) who wish to join them in this pursuit of basic knowledge. 16K reqd.

ENTER: date, time, lat. and long. (Lat. and long. can be perm.) Then choose a planet. In seconds Ephemeris V responds with:

1. **Azimuth and Altitude**
2. **Right Ascension and Declination (for astronomers)**
3. **Simple compass coordinates (for beginners)**
4. **GRAPHIC DISPLAY of planet in current constellation**
5. **LOCAL sidereal (star) time to aid in finding stars, comets, nebulas, etc.**

Own or give this incredible program and reap the harvest of real understanding forever! Comes on quality cassette with documentation. Send a money order or check for $8.00 ppd. to: EPHEMERIS V, P.O. BOX 261, Winchester, KY 40391.

MUSIC and KALEIDOSCOPES

VIRTUOSO. A music synthesis program for the Timex/Sinclair and ZX81 with 2K or more. NO MUSIC KNOWLEDGE NECESSARY! 96 notes. range from put put to above treble clef, any tempo. Whole to 32nd notes. Songs may be saved for future use. Required hardware? - - Your cassette recorder. $6.95 pp.

PLAYER ZX81. A less versatile music program for 1K memory. To: Music knowledge unnecessary. $6.95 pp.

SQUARES and CROSSES, Kaleidoscopic simulations for the same machines. 1K or more. $6.95 pp.

All on standard cassette. Guaranteed to load. Music programs include random sound listing or save copy. Add $3.00 each, outside U.S.

Mr./Mrs./Ms. _____

Address _____

City/State/Zip _____

	CHECK	QUANTITY
Virtuoso $6.95		
Player ZX81 $6.95		
Squares & Crosses $6.95		

William Don Maples
688 Moore St. Lakewood, CO 80215.

Index to Advertisers

Aardvark 41
Abersoft 43
Active Designs 32
Acts Audio 77
Adventure Games 90
Aerco 43
Altex 39
Apropos Tech 65
Atlantic Computer Products 60
Audiograph 54
Balogh, John 91
Barlog Software 76
Berch, Bob 94
Biocal Software 91
Bi-Pak 23
Byte Back Co. 35
CAI Instruments 17
C.E.D. Corp. 89
CSI Company 78
Cleva Computer Ware 33
Computa-Dek 90
Computer Continuum 64
Computer Engineering Services 90
Computercraft 60
Cook Labs 51
Cosmonics 68
DK Tronics ..... Cover 3
DSBC 88
Data Assette 4, 5
Daw Software 88
Double H 45
Down East Computers 76
Downsway 63
Driver Software 79
E-Z Key 89
Edson Electronics 90
Ellanbee Graphics 95
Ephemeris V 96
Ezra Group II 21
Florida Creations 10
Fritsch, D. 78
Frog Software 61
Fulcrum Products 90
Fuller Micro 74
Furlong, Peter, Products 86
Gibbons, J P 57
Gladstone Electronics 48, 49
Hargrave, P. 88
Haymarket Software 63
Heath Computer Services 89
Hunter 61
Hurricane Electronics 56
Independence Research 18
Infinity Research 85
Intellectual Games 91
Intercomputer, Inc. 13
International Publishing 31
J C Software 90
JEU Intelligent 82
JK Audio 16
JRS Software 12, 19
Jenn Products 45
K Soft 46
K B Enterprises 91
KML Incorporated 73
Kayde Electronic Systems 2
Kempston Electric 65
Koala Softbear 84
Kopack Creations, Inc. 67
Lambs Software 82
Lamo Lem 83
Leading Edge ..... Cover 4
M.C. Associates 52
Macronics 40
Maples, William 96
Memotech 9
Micro-80 73
Micro Computers Plus 27
Micro Design Concepts 56
Micro Sync 7
Micro Tech 94
Microtronics 95
Mikro-Gen 57
Mohr & Associates 93
N G M Inc. 95
Nimrod 95
Nirad 57
Non-Trivial Solutions 8
Nooter Stock Program 59
Oasis 65
Omni Technology 43
Overbyte 46
P & B Software 91
Panda Software 22
Peak 93
Powertronix 94
Reston Publishing 37
Robill Products 59
Rom Pac Applications ..... Cover 2
Romark 18
Ruskraft Engineering 89
S.C.I. 91
Savage Software 91
Servitronics 73
Sinclair Place 28
Sinclair Research 14, 15, 81
Sinware 84
Smartware 86
Softclair 60
Softsync Inc. 1
Software Master 47
Southern Computer Systems 25
Strategem Cybernetics 64
Stratos 93
Svec, Henry 91
Synchronize 32
Syncware 87
Synergistic Design 11
T.V. Services 54
Thurnall 85
Time Data 12
Timex Software 95
Troiano Software 94
Turner, Elcy & Com 38
Upsystems 61
White, Chris 94
Wisconsinc 69
Wolfkamp 72
Woods, Tom 88
York 10 45
Z Games 95
Z Ware 60
Zeta Software 77
Zodex 63
Zor Khan Industries 59
ZX Panding 68
Z-West 76

dk'tronics ZX 80/81 SPECTRUM Hardware Software

ZX KEYBOARD

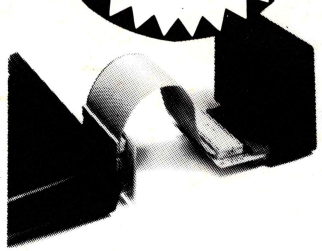
The case is large enough for both the computer (81 or Spectrum) and the power supply to fit inside. **Requires no soldering**

Fully cased with numeric pad $81
Uncased with numeric pad $54
Case $27

SPECTRUM MEMORY UPGRADE TO 48K $71.90

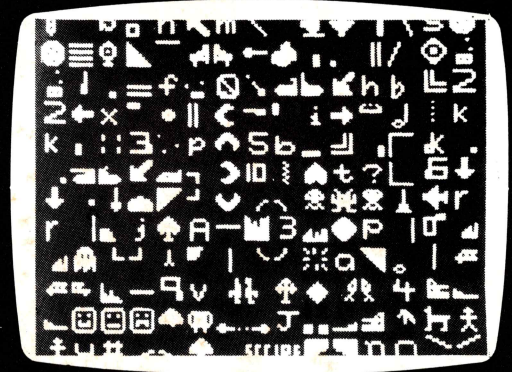
NEW FROM dk'tronics

(A) 16K Ram Massive Add On Memory
Fully assembled and tested **$35.90**
(B) 64K Memory Expansion **$89.90**
(C) 4K Tool kit full of utilities to aid the programmer in constructing and de-bugging E. Prom version for use with graphics Rom **$17.93**
Cassette version **$12.50**
(D) Flexible ribbon connector (as illustrated) **$18**

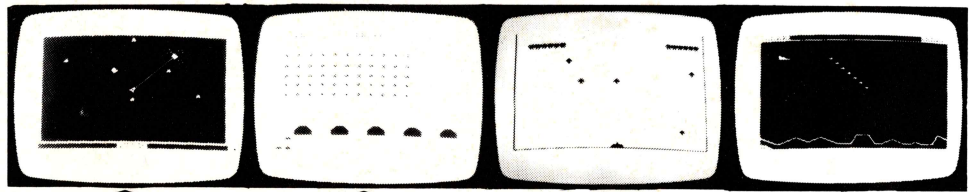


4K Graphics rom

The DK Graphic module is our latest ZX81 accessory. This module, unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you an unbelievable 448 extra pre-programmed graphics, your normal graphic set contains only 64. This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer, with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there; it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets. **$53.91**



SOME OF THE GRAPHICS NOW POSSIBLE ON THE ZX81



★ASTEROIDS ★SPACE INVADERS ★CENTIPEDE ★DEFENDER

16K GRAPHICS ROM SOFTWARE $8.91

dk'tronics

Send off the coupon today, or telephone Great Yarmouth, England (01) 44 493 602453 for our answering service, available 24 hours a day, 7 days a week, quoting your Mastercard or Visa number. (please add on $9 for post and package)

23 Sussex Road,
Gorleston,
GREAT YARMOUTH,
Norfolk. ENGLAND

MasterCard BARCLAYCARD VISA

Please state type of machine, which ROM memory size, quantity and price when ordering.

Please send me ..... @ $ .....
Please send me ..... @ $ .....
Please send me ..... @ $ .....
Please send me ..... @ $ .....
Please send me ..... @ $ .....
Please add on $9 for P/P. I enclose $ .....
Name .....
Address .....

Cheques/I.M.O. payable to D.K.Tronics

THE PROWRITER COMETH.

(And It Cometh On Like Gangbusters.)

Evolution.

It's inevitable. An eternal verity.

Just when you think you've got it knocked, and you're resting on your laurels, somebody comes along and makes a dinosaur out of you.

Witness what happened to the Centronics printer when the Epson MX-80 came along in 1981.

And now, witness what's happening to the MX-80 as the ProWriter cometh to be the foremost printer of the decade.

SPEED

MX-80: 80 cps, for 46 full lines per minute throughput.
PROWRITER: 120 cps, for 63 full lines per minute throughput.

GRAPHICS

MX-80: Block graphics standard, fine for things like bar graphs.
PROWRITER: High-resolution graphics features, fine for bar graphs, smooth curves, thin lines, intricate details, etc.

PRINTING

MX-80: Dot matrix business quality.
PROWRITER: Dot matrix correspondence quality, with incremental printing capability standard.

FEED

MX-80: Tractor feed standard; optional friction-feed kit for about $75 extra.
PROWRITER: Both tractor and friction feed standard.

INTERFACE

MX-80: Parallel interface standard; optional serial interface for about $75 extra.
PROWRITER: Available standard—either parallel interface or parallel/serial interface.

WARRANTY

MX-80: 90 days, from Epson.
PROWRITER: One full year, from Leading Edge.

PRICE

Heh, heh.

Marketed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021. Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

LEADING EDGE.™

For a free poster of "Ace" (Prowriter's pilot) doing his thing, please write us.